



THE CITY OF WINNIPEG

TENDER

TENDER NO. 975-2024

**PEMBINA HIGHWAY OVERPASS AT ABINOJII MIKANAH REHABILITATION AND
RELATED WORKS**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 PEMBINA HIGHWAY OVERPASS AT ABINOJII MIKANAH REHABILITATION AND RELATED WORKS

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, April 2, 2025.
- B2.2 The Contract Administrator or the Manager of Purchasing 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 at no time can the Bidder access any other privately owned property unless authorized by The City and approved by the Contract Administrator.
- B3.3 The Bidder is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid or their performance of the Work, and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection

B4. ENQUIRIES

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D6.1.
- 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 B3.1 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 they have received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.
- B6.6 Notwithstanding B3.1, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D6.

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 their sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.
- B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons they wish to inform.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base their Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B18.
- B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

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

B9. BID

- B9.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.
- B9.2 Paragraph 2 of Form A: Bid/Proposal shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in their own name, their 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 their own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

- B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.
- B9.3 In Paragraph 3 of Form A: Bid/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B9.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in their 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 their duly authorized officer or officers;
 - (d) if the Bidder is carrying on business under a name other than their own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.
- B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

- B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B10.2 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) N/A

B12. CONFLICT OF INTEREST AND GOOD FAITH

- B12.1** Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.
- B12.2** Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:
- (a) other commitments;
 - (b) relationships;
 - (c) financial interests; or
 - (d) involvement in ongoing litigation;
- that could or would be seen to:
- (i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or
 - (ii) compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;
- (e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of their 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 their 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 their 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 their 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 their 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 their sole discretion:
- (a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of their 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 their 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 their 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 their 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, Purchasing Division website at <https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf>

B13.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) have successfully carried out work similar in nature, scope and value to the Work; and
- (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- (d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and D8);

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, Purchasing Division website at <http://www.winnipeg.ca/matmgt/>.)

- B13.5 Further to B13.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at [Accessibility Training](#) for anyone that may have any interaction with the public on behalf of the City of Winnipeg.
- B13.6 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B13.7 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

- B14.1 The Bidder shall include in their Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available at [Form G1 Bid Bond & Agreement to Bond](#).
- B14.2 Bid security shall be submitted in a digital format meeting the following criteria:
- (a) The version submitted by the Bidder must have valid digital signatures and seals;
 - (b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.
 - (c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.
 - (d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.
 - (e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B14.2(a).
- B14.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B18.1(a).
- B14.4 Bonds passing the verification process will be treated as original and authentic.
- B14.4.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B14.5 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.
- B14.6 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Tender.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

- B15.1 Bids will not be opened publicly.
- B15.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.

- B15.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.
- B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).
- B15.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B16. IRREVOCABLE BID

- B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.
- B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly formed and the contract securities have been furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B17. WITHDRAWAL OF BIDS

- B17.1 A Bidder may withdraw their Bid without penalty at any time 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 there from (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 their Bid or in other information required to be submitted, that they are 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.
- B18.4.2 Further to B18.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

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 their own forces;
 - (d) only one Bid is received; or
 - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B19.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2025 Capital Budget. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.
- B19.4 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D45 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.
- B19.5 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B18.
- B19.5.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of their Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2020-01-31) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Tender to a section, clause or subclause with the prefix “C” designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. FORM OF CONTRACT DOCUMENTS

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

D3. SCOPE OF WORK

- D3.1 The Work to be done under the Contract shall consist of the rehabilitation of the Pembina Highway Overpass over Abinojii Mikanah (formerly known as Bishop Grandin Boulevard), Roadworks including all on/off ramps, Landscaping, and replacement of the City of Winnipeg Parks Department Maintenance Building. The Work includes:

- (a) Structural Works
- (b) Overhead Sign Structures
- (c) Roadworks
- (d) Traffic Signals Work
- (e) Water and Waste Work
- (f) Landscaping
- (g) Parks Maintenance Building

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

D3.2.1 Structural Works

- (a) Mobilization
- (b) Concrete patch repairs of abutments and deck
- (c) Concrete crack injections of abutment cracks
- (d) Application of silane sealer coating to concrete abutments and splash zone of piers
- (e) Construct abutment shear blocks
- (f) Partial depth repair of concrete deck and sidewalks, with new layer of stainless steel reinforcing
- (g) Replacement of expansion joints
- (h) Partial reconstruction of concrete approach slabs
- (i) Removal and elimination of existing deck drains
- (j) Removal and replacement of barriers and median curbs
- (k) Removal and replacement of existing pedestrian railings with bicycle railings
- (l) Miscellaneous concrete repairs of the concrete slope paving and embankments
- (m) Demobilization

D3.2.2 Overhead Sign Structures (OHSS) – General:

- (a) Removal and salvaging existing overhead sign structures and cantilever structures
- (b) Removal of existing concrete foundations

- (c) Installation of new concrete foundations
- (d) Installation of salvaged overhead sign structures and cantilever structures
- (e) Supply and installation of new overhead sign structures, cantilever structures, and ground mount structures
- (f) Installation of salvaged guide signs
- (g) Supply and installation of new reflective guide signs
- (h) Supply and installation of Quadguard crash cushions including concrete pads

D3.2.3

Overhead Sign Structures (OHSS) – Detailed Scope:

- (a) S659 – NB Pembina Highway, North of Chancellor Drive – Relocation of OHSS:
 - (i) Removal of existing concrete foundations
 - (ii) Installation of new concrete foundation (915mm diameter piles)
 - (iii) Removal, salvage, and re-installation of existing steel overhead sign support structure (bridge-type)
 - (iv) Removal and salvage of existing guide sign panels to City Yard
 - (v) Supply and installation of new reflective guide sign panels
- (b) S802 – EB to University Crescent Ramp – Supply and Installation of new OHSS:
 - (i) Installation of new concrete foundation (762mm diameter piles)
 - (ii) Supply and Installation of new steel overhead sign support structure (bridge-type)
 - (iii) Supply and installation of new reflective guide sign panels by others
- (c) GMGS – EB to University Crescent Ramp – New ground mount sign:
 - (i) Supply and installation of screw anchor piles (250mm diameter)
 - (ii) Supply and installation of aluminum posts
 - (iii) Supply and installation of new reflective guide sign panel
 - (iv) Per MTI Standard Specifications and details (TE-230B & SC-01), see Appendix E
- (d) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp – Relocation of OHSS:
 - (i) Removal of existing concrete foundation
 - (ii) Installation of new concrete foundation (915mm diameter piles)
 - (iii) Removal, salvage, and re-installation of existing steel overhead sign support structure (cantilever-type)
 - (iv) Removal, salvage, and re-installation of existing guide sign panel
- (e) S649 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp – Removal of OHSS:
 - (i) Removal of existing concrete foundation
 - (ii) Removal and disposal of existing steel overhead sign support structure (cantilever-type)
 - (iii) Removal and salvage of existing guide sign panels to City Yard
- (f) S650 – SB Pembina Highway, North of University Crescent – Temporary removal of OHSS for traffic accommodations:
 - (i) Modifications to median (east) concrete foundation (915mm diameter piles)
 - (ii) Removal, salvage, and re-installation of existing steel overhead sign support structure (bridge-type)
 - (iii) Removal, salvage, and re-installation of existing guide sign panels
- (g) S803 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp – Supply and Installation of new OHSS:

- (i) Installation of new concrete foundation (915mm diameter piles)
 - (ii) Supply and Installation of new steel overhead sign support structure (cantilever-type)
 - (iii) Installation of salvaged "Abinojii West" guide sign panel (from S653)
- (h) S653 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp – Removal of OHSS:
 - (i) Removal of existing concrete foundations
 - (ii) Removal and disposal of existing steel overhead sign support structure (bridge-type)
 - (iii) Removal and salvage of "Abinojii West" guide sign panel (to S803)
 - (iv) Removal and salvage of all other remaining guide signs to City Yard
- (i) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp – Relocation of OHSS:
 - (i) Removal of existing concrete foundation
 - (ii) Installation of new concrete foundation (762mm diameter piles)
 - (iii) Removal, salvage, and re-installation of existing steel overhead sign support structure (cantilever-type)
 - (iv) Removal, salvage, and re-installation of guide sign panel
- (j) S804 – SB Pembina Highway, South of Plaza Drive – Supply and Installation of new OHSS:
 - (i) Installation of new concrete foundation (762mm diameter piles)
 - (ii) Supply and Installation of new steel overhead sign support structure (bridge-type)
 - (iii) Supply and installation of two new reflective guide sign panels
 - (iv) Installation of salvaged guide sign panel "Abinojii Mikanah" (from S651)
- (k) S651 – SB Pembina Highway, South of Plaza Drive – Removal of OHSS:
 - (i) Removal of existing concrete foundations
 - (ii) Removal and disposal of existing steel overhead sign support structure (bridge-type)
 - (iii) Removal and salvage of "Abinojii Mikanah" guide sign panel (to S804)
 - (iv) Removal and salvage of all other remaining guide signs to City Yard
- (l) S797 – NB University Crescent, approaching Pembina Highway – Modifications to OHSS:
 - (i) Removal of existing guide sign panel from steel overhead sign support structure (cantilever-type)
 - (ii) Supply and install new "EXIT ONLY" reflective sign panel below existing guide sign panel
 - (iii) Reattach both guide sign panels
 - (iv) The Contractor shall be responsible for ensuring a 5.3 m clearance below the sign panel. Modifications to the sign panel may be required. These modifications to meet the required clearance are the Contractor's responsibility.

D3.2.4 Roadworks

- (a) Temporary Works (2025)
 - (i) Removal of concrete safety median;
 - (ii) Adjustment of BellMTS manholes (by others);
 - (iii) Installation of temporary asphalt pavement in median (Type MS-1, thickness 120 mm, two lifts)
- (b) Pembina Highway southbound between Plaza Drive and Chancellor Drive, Mill and Fill and Widening including University Crescent intersection (2025):

- (i) Planing existing asphalt overlay where it exists;
 - (ii) Removal of existing concrete pavement with asphalt overlay, as necessary;
 - (iii) Full depth concrete repairs of existing joints and slabs;
 - (iv) Installation of catch basins, catchpits and leads;
 - (v) Adjustment of existing manholes and appurtenances;
 - (vi) Construction of 200 mm reinforced concrete pavements including excavation, compaction of sub-grade, placement of separation/filtration geotextile fabric and/or Class A geogrid, and placement of sub-base and base course (Granular A) materials;
 - (vii) Construction of 150 mm dowelled barrier curb, monolithic median slab, safety curb, transition curbs and separate splash strip;
 - (viii) Construction of 100 mm concrete sidewalk with block outs for paving stone indicator surface;
 - (ix) Placement of asphalt overlay (Type MS-1, average thickness 65 mm);
 - (x) Construction of asphalt pavement paths (Type MS-1, thickness 75mm) including excavation, compaction of sub-grade, placement of separation/ filtration geotextile fabric and Class B geogrid, and placement of sub-base and base course materials; and
 - (xi) Topsoil and Sod.
- (c) Eastbound to Northbound / Southbound Ramp Rehabilitation and New Construction (2025):
- (i) Planing of existing asphalt overlay;
 - (ii) Full depth concrete repairs of existing joints and slabs;
 - (iii) Removal of existing curbs;
 - (iv) Construction of 120 mm mountable curb for asphalt pavement, traffic barrier, transition curb, 180 mm integral barrier curb, and separate splash strips.
 - (v) Adjustment of existing catch basins;
 - (vi) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (vii) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts));
 - (viii) Construction of 230 mm plain-dowelled concrete pavements including excavation, compaction of sub-grade, placement of separation/ filtration geotextile fabric and/or Class A geogrid, and placement of sub-base and base course (Granular A) materials
 - (ix) Construction of 100 mm concrete sidewalk;
 - (x) Construction of asphalt pavement paths (Type MS-1, thickness 75mm) including excavation, compaction of sub-grade, placement of separation/ filtration geotextile fabric and/or Class B geogrid, and placement of sub-base and base course materials; and
 - (xi) Topsoil and Sod.
- (d) Southbound to Westbound Ramp Rehabilitation (2025):
- (i) Planing of existing asphalt overlay;
 - (ii) Full depth concrete repairs of existing joints and slabs;
 - (iii) Removal of existing curbs;
 - (iv) Adjustment of existing catch basins;
 - (v) Construction of 120 mm mountable curb for asphalt overlay;
 - (vi) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (vii) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts)); and
 - (viii) Topsoil and Sod.

- (e) Southbound to Eastbound Loop Rehabilitation (2025):
 - (i) Planing of existing asphalt overlay;
 - (ii) Full depth concrete repairs of existing joints and slabs;
 - (iii) Removal of existing curbs;
 - (iv) Adjustment of existing catch basins;
 - (v) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (vi) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts)); and
 - (vii) Topsoil and Sod.
- (f) Pembina Highway northbound between Chancellor Drive and Plaza Drive, Mill and Fill and Widening including University Crescent intersection (2026):
 - (i) Planing existing asphalt overlay where it exists;
 - (ii) Removal of existing concrete pavement with asphalt overlay, as necessary;
 - (iii) Full depth concrete repairs of existing joints and slabs;
 - (iv) Installation of catch basins, catchpits and leads;
 - (v) Adjustment of existing manholes and appurtenances;
 - (vi) Construction of 200 mm reinforced concrete pavements including excavation, compaction of sub-grade, placement of separation/ filtration geotextile fabric and/or Class A geogrid, and placement of sub-base and base course (Granular A) materials;
 - (vii) Construction of 150 mm dowelled barrier curb, 150 mm barrier curb for asphalt pavement, monolithic median slab, safety curb, transition curbs and separate splash strip;
 - (viii) Construction of monolithic concrete curb and sidewalk for asphalt pavement;
 - (ix) Construction of 100 mm concrete sidewalk with block outs for paving stone indicator surface;
 - (x) Placement of asphalt overlay (Type MS-1, average thickness 65 mm);
 - (xi) Construction of asphalt pavement paths (Type MS-1, thickness 75mm) including excavation, compaction of sub-grade, placement of separation/ filtration geotextile fabric and/or Class B geogrid, and placement of sub-base and base course materials; and
 - (xii) Topsoil and Sod.
- (g) Northbound to Eastbound Ramp, Rehabilitation (2026):
 - (i) Full depth concrete repairs of existing joints and slabs;
 - (ii) Removal of existing curbs;
 - (iii) Adjustment of existing catch basins;
 - (iv) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (v) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts)); and
 - (vi) Topsoil and Sod.
- (h) Northbound to Westbound Loop Rehabilitation (2026):
 - (i) Planing of existing asphalt overlay;
 - (ii) Full depth concrete repairs of existing joints and slabs;
 - (iii) Removal of existing curbs;
 - (iv) Adjustment of existing catch basins;
 - (v) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (vi) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts)); and
 - (vii) Topsoil and Sod.

- (i) Westbound to Northbound / Southbound Ramp Rehabilitation (2026):
 - (i) Planing of existing asphalt overlay;
 - (ii) Full depth concrete repairs of existing joints and slabs;
 - (iii) Removal of existing curbs;
 - (iv) Adjustment of existing catch basins;
 - (v) Placement of asphalt overlay (Type MS-1, average thickness 80 mm);
 - (vi) Placement of asphalt overlay for shoulder (Type MS-1, thickness 125 mm (2 lifts));
 - (vii) Renewal of existing concrete sidewalk; and
 - (viii) Topsoil and Sod.
- (j) Restoration of Temporary Works (2026):
 - (i) Remove temporary asphalt pavement;
 - (ii) Adjustment of BellMTS manholes (by others);
 - (iii) Installation of safety curb and concrete median slab;

D3.2.5 Traffic Signals Work

- (a) Installation of Traffic Signals conduit and service boxes
- (b) Installation of concrete bases

D3.2.6 Water and Waste Work

- (a) External point repairs
- (b) Grouting manholes

D3.2.7 Landscaping

- (a) Removal of trees near the Parks Maintenance Building
- (b) Topsoil
- (c) Sodding

D3.2.8 Parks Storage Garage

- (a) Remove existing Parks Storage Garage
- (b) Installation of new Parks Storage Garage
 - (i) Electrical
 - (ii) Water and Waste Servicing
- (c) Installation of concrete pavement for parking area.

D3.3 The following shall apply to the Work:

- (a) City of Winnipeg Green Building Policy: New City-Owned Buildings and major additions;
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=5989>
- (b) Universal Design Policy
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=3604>

D4. **SITE INVESTIGATION DUE DILIGENCE AND RISK**

- D4.1 Notwithstanding C3.1, the Contractor acknowledges that the site investigation reports and other site information included in this Tender have been provided to it and may be relied upon by the Contractor to the extent that the Contractor uses Good Industry Practice in interpreting such report(s) and site information and carries out the Work in accordance with Good Industry Practice based upon such report(s) and the information contained in them and such other site information. In the event that a site condition related to:

- (a) the location of any utility which can be determined from the records or other information available at the offices of any public authority or person, including a municipal corporation and any board or commission thereof, having jurisdiction or control over the utility;
- (b) the Site conditions, including but not limited to subsurface hazardous materials or other concealed physical conditions;
- (c) the location, nature, quality or quantity of the materials to be removed or to be employed in the performance of the Work;
- (d) the nature, quality or quantity of the Plant needed to perform the Work;
- (e) all matters concerning access to the Site, power supplies, location of existing services, utilities or materials necessary for the completion of the Work; and
- (f) all other matters which could in any way affect the performance of the Work;

that could not have been “properly inferable”, “readily apparent” and readily discoverable” using Good Industry Practice by the Contractor, results in additional Work which is a direct result of this newly discovered site condition, such additional Work will be considered by the City under Changes in Work.

D5. DEFINITIONS

D5.1 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 Tender 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 Tender shall apply to the Work ;
- (c) “**CGSB**” means the Canadian General Standards Board that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Tender shall apply to the Work.
- (d) “**CSA**” means the Canadian Standards Association that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Tender shall apply to the Work .
- (e) “**CWB**” means the Canadian Welding Bureau that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Tender shall apply to the Work.
- (f) “**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 Tender shall apply to the Work.
- (g) “**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 Tender shall apply to the Work.
- (h) “**Supply Chain Disruption**” means an inability by the Contractor to obtain goods or services from third parties necessary to perform the Work of the Contract within the schedule specified therein, despite the Contractor making all reasonable commercial efforts to procure same. Contractors are advised that increased costs do not, in and of themselves, amount to a Supply Chain Disruption;

D6. CONTRACT ADMINISTRATOR

D6.1 The Contract Administrator is Stantec Consulting Ltd., represented by:

Bill Ebenspanger, P.Eng.
Senior Structural Engineer

Telephone No. (204) 977-8370
Email Address Bill.Ebenspanger@stantec.com

- D6.2 At the pre-construction meeting, Bill Ebenspanger will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work

D7. CONTRACTOR'S SUPERVISOR

- D7.1 At the pre-construction meeting, the Contractor shall identify their designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.
- D7.2 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 D7.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D8. ACCESSIBLE CUSTOMER SERVICE REQUIREMENTS

- D8.1 The Accessibility for Manitobans Act (AMA) imposes obligations on the City of Winnipeg to provide accessible customer service to all persons in accordance with the Customer Service Standard Regulation ("CSSR") to ensure inclusive access and participation for all people who live, work or visit Winnipeg regardless of their abilities.
- D8.1.1 The Contractor agrees to comply with the accessible customer service obligations under the CSSR and further agrees that when providing the Goods or Services or otherwise acting on the City of Winnipeg's behalf, shall comply with all obligations under the AMA applicable to public sector bodies.
- D8.1.2 The accessible customer service obligations include, but are not limited to:
- (a) providing barrier-free access to goods and services;
 - (b) providing reasonable accommodations;
 - (c) reasonably accommodating assistive devices, support persons, and support animals;
 - (d) providing accessibility features e.g. ramps, wide aisles, accessible washrooms, power doors and elevators;
 - (e) inform the public when accessibility features are not available;
 - (f) providing a mechanism or process for receiving and responding to public feedback on the accessibility of all goods and services; and
 - (g) providing adequate training of staff and documentation of same.

D9. UNFAIR LABOUR PRACTICES

- D9.1 Further to C3.2, the Contractor declares that in bidding for the Work and in entering into this Contract, the Contractor and any proposed Subcontractor(s) conduct their respective business in accordance with established international codes embodied in United Nations Universal Declaration of Human Rights (UDHR) <https://www.un.org/en/about-us/universal-declaration-of-human-rights> International Labour Organization (ILO) [https://www.ilo.org/global/lang--en/index.htm](https://www.ilo.org/global/lang-en/index.htm) conventions as ratified by Canada.
- D9.2 The City of Winnipeg is committed and requires its Contractors and their Subcontractors, to be committed to upholding and promoting international human and labour rights, including fundamental principles and rights at work covered by ILO eight (8) fundamental conventions and the United Nations Universal Declaration of Human Rights which includes child and forced labour.

- D9.3 Upon request from the Contract Administrator, the Contractor shall provide disclosure of the sources (by company and country) of the raw materials used in the Work and a description of the manufacturing environment or processes (labour unions, minimum wages, safety, etc.).
- D9.4 Failure to provide the evidence required under D9.3, may be determined to be an event of default in accordance with C18.
- D9.5 In the event that the City, in its sole discretion, determines the Contractor to have violated the requirements of this section, it will be considered a fundamental breach of the Contract and the Contractor shall pay to the City a sum specified by the Contract Administrator in writing ("Unfair Labour Practice Penalty"). Such a violation shall also be considered an Event of Default, and shall entitle the City to pursue all other remedies it is entitled to in connection with same pursuant to the Contract.
- D9.5.1 The Unfair Labour Practice Penalty shall be such a sum as determined appropriate by the City, having due regard to the gravity of the Contractor's violation of the above requirements, any cost of obtaining replacement goods/ services or rectification of the breach, and the impact upon the City's reputation in the eyes of the public as a result of same.
- D9.5.2 The Contractor shall pay the Unfair Labour Practice Penalty to the City within thirty (30) Calendar Days of receiving a demand for same in accordance with D9.5. The City may also hold back the amount of the Unfair Labour Practice Penalty from payment for any amount it owes the Contractor.
- D9.5.3 The obligations and rights conveyed by this clause survive the expiry or termination of this Contract, and may be exercised by the City following the performance of the Work, should the City determine, that a violation by the Contractor of the above clauses has occurred following same. In no instance shall the Unfair Labour Practice Penalty exceed the total of twice the Contract value.

D10. FURNISHING OF DOCUMENTS

- D10.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D11. AUTHORITY TO CARRY ON BUSINESS

- D11.1 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.

D12. SAFE WORK PLAN

- D12.1 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.
- D12.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at the City of Winnipeg, Corporate Finance, Purchasing Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>
- D12.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at their sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good

Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D13. INSURANCE

D13.1 The City shall provide and maintain the following owner-controlled project insurance coverage to remain in place as outlined below. The City reserves the right to add, delete, revise and redefine insurance requirements and deductibles at any time, at its sole discretion, or as necessitated by market conditions and/or extension to the insurance policies during the term of the Project.

- (a) All risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price of the works for the Pembina Highway Overpass and Parks Department Maintenance Building. Such policy will be written in the joint names of the City, Contractor and Subcontractors including testing and commissioning (if applicable) and shall remain in place until Substantial Performance. The Contractor shall be responsible for deductibles up to \$100,000 except for flood and water damage losses subject to \$150,000 deductible.
- (b) Wrap-up liability insurance in an amount of no less than ten million dollars (\$10,000,000) inclusive per occurrence and ten million dollars (\$10,000,000) general aggregate, covering bodily injury, personal injury, damage to the existing structure, hook liability property damage 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 shall be responsible for deductibles up to \$50,000 maximum of any one loss.
 - (ii) The City will carry such insurance to cover the City, Contractors, and Subcontractors 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.
 - (iii) BellMTS, Manitoba Hydro, Shaw and Telus shall be shown as additional insured, as required by contract, if applicable.
 - (iv) 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, or as determined by the City, and shall include an additional twenty-four (24) months completed operations coverage which will take affect after Total Performance.

D13.2 The Contractor shall provide and maintain the following insurance coverage at all times during the performance of the Work and throughout the warranty period:

- (a) commercial general liability insurance, in the amount of at least five million dollars (\$5,000,000.00) inclusive, with the City added as an additional insured, with across-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations;
- (b) Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence;
- (c) Property insurance for 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.

D13.3 Deductibles shall be borne by the Contractor.

- D13.4 The Contractor shall provide their experience on similar projects and five (5) year loss history on Projects and any other pertinent information needed to enable the City to place the construction insurance policies outlined in D14.1 above within five (5) business days of the request of the information.
- D13.5 All policies shall be taken out with insurers duly licensed to carry on business in the Province of Manitoba.
- D13.6 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in the C4.1 for the return of the executed Contract.

D14. CONTRACT SECURITY

- D14.1 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, [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, [Form H2 Labour and Material Bond](#), in an amount equal to fifty percent (50%) of the Contract Price.
- D14.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:
- (a) the version submitted by the Contractor must have valid digital signatures and seals;
 - (b) the version submitted by the Contractor must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.
 - (c) the version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.
 - (d) the verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.
 - (e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D15.1(b).
- D14.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in their discretion, exercised reasonably, allows.
- D14.1.3 Digital bonds passing the verification process will be treated as original and authentic.
- D14.2 The Contractor shall provide the Contract Administrator identified in D6 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.
- D14.3 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 D15.1(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.

D15. SUBCONTRACTOR LIST

- D15.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract Documents, if applicable.

D16. EQUIPMENT LIST

- D16.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D17. DETAILED WORK SCHEDULE

- D17.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.
- D17.2 The detailed work schedule shall consist of a “baseline schedule” component showing the planned start and completion dates for all activities/tasks. In addition, the detailed work schedule shall consist of an “update schedule” component showing the Contractor’s updated planned or actual start, progress and completion dates for each activity/task as construction proceeds in order to compare Contractor’s planned baseline schedule versus actual execution of the Work.
- D17.3 The Contractor’s planned baseline detailed work schedule will be reviewed by Contract Administrator as a Submittal for conformance to the Project intent and general conformance to the requirements of the Contract.
- D17.4 The Contractor shall not change the baseline portion of the detailed work schedule, once it has been reviewed without issue by the Contract Administrator, without prior consent or until requested by the Contract Administrator.
- D17.5 The detailed work schedule shall consist of the following:
- (a) a critical path method (C.P.M.) schedule for the Work;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule;
 - (c) capacity to show simultaneously the planned baseline schedule as well as the update schedule for each activity/task;
 - (d) all acceptable to the Contract Administrator.
- D17.6 Further to D18.5(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:
- (a) Date of Commencement of the Work;
 - (b) Mobilization to Site;
 - (c) Critical Stages as listed in D28;
 - (d) Substantial Performance;

- (e) Total Performance;
- (f) Demobilization from Site.

D17.7 Landscaping Maintenance and other Maintenance

D17.8 Further to D18.5(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D17.9 Without changing the baseline portion of the detailed work schedule, at least once per month or within two (2) Working Days upon request from the Contract Administrator, Contractor shall accurately update the "update schedule".

D17.10 Should Contractor's operations fall behind the accepted detailed work schedule, Contractor shall, at no change in Contract Price, take corrective action to get back on schedule.

D17.11 Contractor shall provide sub-schedules to define critical portions of the Work upon reasonable request from the Contract Administrator.

D18. REQUIREMENTS FOR SITE ACCESSIBILITY PLAN

D18.1 The Contractor shall provide the Contract Administrator with an Accessibility Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D18.2 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

- (a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).
- (b) How the Contractor will maintain access to bus stops within the site.
- (c) How the Contractor will maintain access to pedestrian corridors and half signals.
- (d) How the Contractor will maintain cycling facilities.
- (e) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.
- (f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.

D18.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.

D18.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:

- (a) Signage
- (b) Temporary Ramping
- (c) Transit Stops
- (d) Detour Signage

D18.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure that all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.

- D18.6 Any changes to the Accessibility Plan must be approved by the Contract Administrator.
- D18.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.
- D18.8 Deficiencies as a direct result of actions by the Contractor that are not immediately corrected and/or failure to produce records that demonstrate that the site was maintained in compliance with the Accessibility Plan may result in a pay adjustment via the monthly Progress Payment. The rate of pay adjustment will be as per the following schedule:
- (a) First Offence – A warning will be issued and documented in the weekly or bi-weekly site meeting.
 - (b) Second Offence – A field instruction to immediately correct the site will be issued by the Contract Administrator.
- D18.9 Third and subsequent Offences – A pay reduction will be issued in the amount of \$250.00 per instance and per day.

D19. ENVIRONMENTAL PROTECTION PLAN

- D19.1 Prior to commencing construction activities or delivery of materials to Site, submit an Environmental Protection Plan for review and approval by Contract Administrator. The Environmental Protection Plan shall present a comprehensive plan to address all of the Contractor's chosen means and methods towards performing the Work that may impact the environment. The submission of the Environmental Protection Plan to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the success or failure of all environmental management practices and procedures.
- D19.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:
- (a) Federal
 - (i) Canadian Environmental Assessment Act, 2012 (CEAA, 2012)
 - (ii) Canadian Environmental Protection Act (CEPA) C.33;
 - (iii) Hazardous Products Act C.H.-3;
 - (iv) Transportation of Dangerous Goods Act and Regulations C.34;
 - (v) Migratory Birds Convention Act and Regulations, c. 22;
 - (vi) Species at Risk Act, c. 29;
 - (vii) Transportation Association of Canada's National Guide to Erosion and Sediment Control on Roadway Projects, 2005.
 - (viii) And any other applicable Acts, Regulations and By-laws;
 - (b) Provincial
 - (i) The Dangerous Goods Handling and Transportation Act D12;
 - (ii) The Endangered Species and Ecosystems Act E111;
 - (iii) The Environment Act C.E125;
 - (iv) The Fire Prevention Act F80;
 - (v) The Manitoba Heritage Resources Act H39-1;
 - (vi) The Manitoba Noxious Weeds Act N110;
 - (vii) The Manitoba Nuisance Act N120;
 - (viii) Pesticides and Fertilizers Control Act P40;
 - (ix) The Public Health Act C.P210; and
 - (x) The Workplace Safety and Health Act W210;
 - (xi) And current applicable associated regulations;
 - (xii) And any other applicable Acts, Regulations, and By-laws.

(c) Municipal

- (i) The City of Winnipeg By-law Neighbourhood Liveability No. 1/2008 and all amendments;
- (ii) The City of Winnipeg Traffic By-law No. 1573/77 and all amendments;
- (iii) City of Winnipeg Motor Vehicle Noise Policies and Guidelines;
- (iv) The City of Winnipeg Sewer By-law No. 92/2010 and all amendments;
- (v) Any other applicable Acts, Regulations, and By-laws and associated updates and amendments.

D19.3 The Contractor is advised that the following environmental protection measures apply to the Work.

D19.3.1 Materials Handling and Storage

- (a) Storage of construction materials and equipment will be confined within a fenced area or at a location approved by the Contract Administrator with environmental protection (e.g. silt fence) as appropriate.
- (b) Construction materials and debris will be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.
- (c) Construction materials and debris will 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.

D19.3.2 Fuel Handling and Storage

- (a) The Contractor will obtain all necessary permits from Manitoba Sustainable Development (MSD) for the handling and storage of fuel products and shall provide copies to the Contract Administrator.
- (b) All fuel handling and storage facilities will comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.
- (c) Fuels, lubricants and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act will be stored and handled within approved storage areas.
- (d) The Contractor will ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dike and are located a minimum distance of 100 m away from Seine River and any other watercourse. Dikes will be designed, constructed, and maintained to retain not less than one hundred percent (100%) of the capacity of the total number of containers or one hundred and ten percent (110%) of the largest container, whichever is greatest. The dikes will be constructed of clay or similar impervious material. If this type of material is not available, the dike will be constructed of locally available material and lined with high density polyethylene (HDPE). Furthermore, the fuel storage area(s) will be secured by a barrier such as a high fence and gate to prevent vandalism.
- (e) The Contractor will ensure that all fuel storage containers are inspected daily for leaks and spillage.
- (f) Products transferred from the fuel storage area(s) to specific Work sites will not exceed the daily usage requirement.
- (g) 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 will be spread on the ground to catch the fluid in the event of a leak or spill.
- (h) Wash, refuel and service machinery and store fuel and other materials for the machinery a minimum of 100 m away from watercourses to prevent deleterious substances from entering the water.

- (i) The area around storage sites and fuel lines will be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.
- (j) Machinery is to arrive on Site in a clean condition and is to be maintained free of fluid leaks.
- (k) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills will be stored nearby on Site. The Contractor will ensure that additional material can be made available on short notice. Additionally, appropriate staff on Site will be trained in proper handling of deleterious liquids (i.e. fueling) and trained on how to prevent and clean-up minor spills.

D19.3.3 Waste Handling and Disposal

- (a) The construction area will be kept clean and orderly at all times and at the completion of construction.
- (b) At no time during construction will personnel or construction waste be permitted to accumulate for more than one (1) day at any location on the construction Site, other than at a dedicated storage area as may be approved by the Contract Administrator.
- (c) The Contractor will, 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 Disposal Grounds Regulation, Manitoba Regulation 150/91. Exceptions are liquid industrial and hazardous wastes which require special disposal methods.
- (d) On Site volumes of sewage and/or septage will be removed on a weekly basis.
- (e) The Contractor will ensure sewage, septage and other liquid wastes generated on Site are handled and disposed of by a certified disposal Contractor.
- (f) Indiscriminate dumping, littering, or abandonment will not take place.
- (g) No burning of waste or other materials is permitted.
- (h) Clearing debris will be disposed of by chipping and/or mulching with the material being used by the City of Winnipeg for future uses.
- (i) The Contractor will use structurally suitable Site excavation material as fill within the project. Should excavated material exceed fill needs, the remainder would be stockpiled for use on other local projects.
- (j) Structurally unsuitable site excavation material will be removed by the Contractor.
- (k) Waste storage areas will not be located so as to block natural drainage.
- (l) Waste storage areas will be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

D19.3.4 Dangerous Goods/Hazardous Waste Handling and Disposal

- (a) Dangerous goods/hazardous waste are identified by, and will be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.
- (b) The Contractor will be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.
- (c) The Contractor will have on Site staff that are 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.
- (d) Different waste streams will not be mixed.
- (e) Disposal of dangerous goods/hazardous wastes will be at approved hazardous waste facilities.
- (f) Liquid hydrocarbons will not be stored or disposed of in earthen pits on Site.
- (g) Used oils will be stored in appropriate drums, or tankage until shipment to waste oil recycling centres, incinerators, or secure disposal facilities approved for such wastes.

- (h) Used oil filters will be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.
- (i) Dangerous goods/hazardous waste storage areas will be located at least 100 m away from the ordinary high water line of any watercourse or wetland areas and be diked.
- (j) Dangerous goods/hazardous waste storage areas will not be located so as to block natural drainage.
- (k) Dangerous goods/hazardous waste storage areas will be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

D19.3.5 Emergency Response

- (a) The Contractor will ensure that due care and caution is taken to prevent spills.
- (b) The Contractor will 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) 945-4888.
- (c) The Contractor will designate a qualified supervisor as the onsite emergency response coordinator for the project. The emergency response coordinator will have the authority to redirect manpower in order to respond in the event of a spill.
- (d) The following actions will 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 the accident.
 - ◆ Indicate injuries, if any.
 - ◆ Request assistance as required by magnitude of accident [Manitoba Sustainable Development 24 hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup].
 - (ii) Attend to public safety:
 - ◆ Stop traffic, roadblock/cordon off the immediate danger area.
 - ◆ Eliminate ignition sources.
 - ◆ Initiate evacuation procedures if necessary.
 - (iii) Assess situation and gather information on the status of the situation, noting:
 - ◆ Personnel on Site.
 - ◆ Cause and effect of spill.
 - ◆ Estimated extent of damage.
 - ◆ Amount and type of material involved.
 - ◆ 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 dyking.
 - ◆ Prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking.
- (e) Resume any effective action to contain, clean up, or stop the flow of the spilled product.

- (f) The emergency response coordinator will 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 Reports Regulation 439/87.
- (g) 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.
- (h) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to with in-house resources without formal notification to Manitoba Sustainable Development.
- (i) City emergency response, 9-1-1, shall be used if other means are not available.

Table D17-1: Environmental Accident Reporting

Reportable Quantities of Spills that must be Reported to Manitoba Sustainable Development [(204) 944-4888]		
Classification	Hazard	Reportable Quantity or Level
1	Explosives All	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 Packing Group I and II	Oxidizer	1 Kg or 50 L
Packing Group II	Oxidizer	5 Kg or 50 L
5.2	Organic Peroxide	1 Kg or 1L
6.1 Packing Group I	Acute Toxic	1 Kg or 1L
Packing Groups II and III	Acute Toxic	5 Kg or 5L
6.2	Infectious	All
7	Radioactive	Any discharge or level exceeding 10 m Sv/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 grams
9.2	Aquatic Toxic	1 Kg or 1 L
9.3	Wastes (Chronic Toxic)	Kg or 5 L

* Container Capacity (refers to container water capacity)

Source: Environmental Accident Reporting Regulation M.R. 439/87

D19.3.6

Noise and Vibration

- (a) Noise generating activities will be limited to the hours indicated in the City of Winnipeg Neighbourhood Liveability By-law No. 1/2008. The activities will generally be restricted to 7:00 AM to 7:00 PM, weekdays with written permission of the Contract Administrator and the City of Winnipeg for any after-hours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities.
- (b) The Contractor will be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable

limits. The Contractor will also demonstrate to the Contract Administrator that Works to be performed during the night-time period, on Sundays, and Holidays will not exceed the approved limit.

- (c) The Contractor will locate stationary noise generating equipment (e.g., generators) away from sensitive receptors and wildlife areas.
- (d) Construction vehicles and equipment will adhere to posted speed limits.

D19.3.7 Dust and Emissions

- (a) Construction vehicles and machinery will be kept in good working order by the Contractor through the use of inspection and maintenance.
- (b) The Contractor will minimize construction equipment idling times and turn off machinery, when feasible.
- (c) Dust control practices implemented by the Contractor during construction will include regular street cleaning and dampening of construction access roads and Works areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.
- (d) Only water or chemicals approved by the Contract Administrator will be used for dust control. The use of waste petroleum or petroleum by-products is not permitted.
- (e) The Contractor will 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.
- (f) Stockpiled soils will be wetted down or covered with tarpaulin covers to prevent the creation of dust, when appropriate.

D19.3.8 Erosion Control

- (a) Exposure of soils along drain slopes will be kept to the minimum practical amount, acceptable to the Contract Administrator.
- (b) All areas disturbed during construction will be landscaped and revegetated with native plant species in order to restore and enhance the Site and protect against soil erosion unless otherwise indicated.
- (c) The disturbed surface will be revegetated as soon as possible and done so as to create a dense root system in order to defend against soil erosion within the Work area and any other disturbed areas susceptible to erosion.
- (d) The loss of topsoil and the creation of excessive dust by wind during construction will be prevented by the addition of temporary cover crop, water or tackifier, if conditions so warrant.
- (e) The Contractor will routinely inspect all erosion and sediment control structures and immediately carry out any necessary maintenance. Several inspections will be performed during rainy days.
- (f) Construction activities will be avoided during periods of high winds to prevent erosion and the creation of dust.

D19.3.9 Runoff Control

- (a) Measures will be undertaken to ensure that runoff containing suspended soil particles is minimized from entering the land drainage system to the extent possible to the satisfaction of the Contract Administrator.
- (b) 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.
- (c) Construction activities on erodible slopes will be avoided during spring runoff and heavy rain falls.

D19.3.10 Wildlife

- (a) The Contractor will adhere to all of the protection measures below, as well as the protection and mitigation measures for barn swallows, a Migratory bird species also protected under the federal Species At Risk Act (SARA), as described in Section D17.
- (b) The clearing of trees, shrubs or vegetation should be avoided between May 15 and September 30 of any year to protect nesting and breeding season for migratory birds and other wildlife, unless otherwise identified by a Project Biologist. Any trees or shrubs to be removed should be checked for active nests before removal.
- (c) No one will disturb, move or destroy migratory birds' nests; see Section D17 for more information on required mitigation for existing birds' nests in the Work area.
- (d) If a nest is encountered, Work will cease in the immediate area and the Contract Administrator will be contacted for further direction.
- (e) In the event that Species At Risk are encountered during the project construction, all Work will cease in the immediate area, the Site will be made safe and the Contract Administrator will be contacted.

D19.3.11 Vegetation

- (a) The Contractor will clearly mark the disturbance limit prior to commencement of the Work and will remain marked throughout the construction period.
- (b) Vegetation will not be disturbed without written permission from the Contract Administrator.
- (c) The Contractor will limit the removal of trees and snags (standing dead trees), surface disturbance and vegetation clearing.
- (d) Herbicides and pesticides will not be used adjacent to any surface watercourse.
- (e) Trees or shrubs will not be felled into watercourses.
- (f) Areas where vegetation is removed during clearing and construction activities will be stabilised and revegetated as soon as possible in accordance with the landscaping plans forming part of the Contract, or as directed by the Contract Administrator.
- (g) Trees damaged during construction activities will be examined by bonded tree care professionals. Viable trees damaged during construction activities will be pruned according to good practices by bonded tree care professionals.

D19.3.12 Landscaping

- (a) (a) Construction waste (excluding common construction gravel, sand, etc.) will be removed to a minimum depth of 600mm below final grade in all areas that are to be backfilled with suitable material and revegetated in accordance with the City of Winnipeg Standard Construction Specifications.
- (b) Topsoil will be stripped prior to construction and salvaged for use during landscaping.
- (c) Surplus topsoil will be properly stockpiled for use in other projects.
- (d) The Contractor will adhere to the landscaping plan for the maintenance of initial stages and development stages of the plant community.

D19.3.13 Heritage Resources

- (a) 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 Resource Branch, Manitoba Culture, Heritage, Tourism and Sport or the Project Archaeologist, 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 with the Historic Resources Branch, Manitoba Culture, Heritage, Tourism and Sport.
- (b) The Contractor will be prepared to continue his Work elsewhere on the project while the Archaeologist investigates the find and determines its heritage value.

- (c) 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.
- (d) Construction and excavation Work will not resume until the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Culture, Heritage, Tourism and Sport, or the Project Archaeologist, authorizes a resumption of Work.
- (e) If human remains are uncovered during the construction and soil removal process, all Work will cease and the Heritage Resources Branch, Manitoba Culture, Heritage, Tourism and Sport will be contacted by the Contract Administrator. The Historic Resources Branch will contact the City of Winnipeg Police.
- (f) If the human remains are not considered forensic, (i.e., no foul play suspected), they will be removed by the Historic Resources Branch, Manitoba, Culture, Heritage, Tourism and Sport or the Project Archaeologist and turned over to the Province.
- (g) If the human remains are considered forensic, the City of Winnipeg Police will be responsible for their removal.
- (h) Additional information may be obtained by contacting: Archaeological Assessment Services, Historic Resources Branch.

D19.3.14 Construction Traffic

- (a) Workforce parking will be limited to the areas designated for such as detailed in the Contract Documents, or as otherwise may be directed by the Contract Administrator.
- (b) Large equipment will be equipped with flashing beacons and/or an audible “back up” warning device that is audible when the transmission is in reverse.
- (c) The Contractor will 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 Public Works Department.
- (d) The Contractor’s laydown area, construction Site and access road will be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to construction areas and to control any potential hazard to the public, particularly children.
- (e) For circumstances where the Contract Administrator has accepted Site access of special equipment or material, the Contractor will provide adequate flagmen for traffic control in the vicinity of any public buildings.

D19.3.15 Access

- (a) The Contractor will maintain access to affected residential properties.
- (b) The Contractor will provide or maintain general and off-street access to any affected business during construction.

D20. ENVIRONMENTAL PROTECTION PLAN – MIGRATORY BIRDS

- D20.1 In addition to the provisions outlined in D21, prior to commencing construction activities or delivery of materials to Site, the Contractor shall provide mitigation measures at the bridge site to protect barn swallows under the federal *Migratory Birds Convention Act*, a bird species that is currently listed as a ‘threatened’ species on Schedule 1 of the federal Species At Risk Act (SARA). These Acts provide legal protection to barn swallows, and contravention of these Acts can result in legal actions and monetary fines.
- D20.2 The Contractor shall provide appropriate mitigation measures.
- D20.3 Notwithstanding the measurement and payment terms of Environmental Protection Plan – Migratory Birds during construction, including monitoring shall be considered incidental to the Work.

D21. SITE PLAN

- D21.1 The Contractor shall provide the Contract Administrator with a Site 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.
- D21.2 The Contractor shall submit a Site Plan for the Work to the Contract Administrator with:
- (a) access points from public roads to laydown areas;
 - (b) construction access crossings of the rail lines (if any);
 - (c) fenced laydown area locations including gates;
 - (d) staging areas for various types of work (Undergrounds, Bridge, Roadworks etc.);
 - (e) office facility locations with power supply, for both the Contractor and Contract Administrator.

SCHEDULE OF WORK

D22. COMMENCEMENT

- D22.1 The Contractor shall not commence any Work until they are in receipt of an award letter from the Award Authority authorizing the commencement of the Work.
- D22.2 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 D12;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the twenty-four (24) hour emergency response phone number specified in D7.2;
 - (iv) the Safe Work Plan specified in D13;
 - (v) evidence of the insurance specified in D14;
 - (vi) the contract security specified in D15;
 - (vii) the Subcontractor list specified in D16;
 - (viii) the equipment list specified in D17;
 - (ix) the detailed work schedule specified in D18;
 - (x) the Requirements for Site Accessibility Plan specified in D19;
 - (xi) the Social Procurement Plan specified in D20;
 - (xii) the Environmental Protection Plan specified in D21 and D22;
 - (xiii) the Site Plan as specified in D23; and
 - (xiv) the direct deposit application form specified in D39.
 - (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.
- D22.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the award letter.
- D22.4 The City intends to award this Contract by May 7, 2025.
- D22.4.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D23. RESTRICTED WORK HOURS

D23.1 Further to 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.

D23.2 The following work hour restrictions shall also apply:

- (a) Accommodation for the Manitoba Marathon is required within the Site. Events are scheduled for June 15, 2025 and June 21, 2026. The dates and courses are subject to change and will be confirmed in advance of the event.

D24. WORK BY OTHERS

D24.1 Further to C6.25, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working within the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of Work and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D24.2 Work by others on or near the Site will include but not necessarily be limited to:

- (a) City of Winnipeg Tender 252-2024: University Crescent Land Drainage Sewer Installation and Pavement Reconstruction. Direct overlap of the Work of this Contract and Tender 252-2024 is not expected.
- (b) City of Winnipeg Tender 166-2025 for Westbound Abinojii Mikanah Rehabilitation from Dakota Street to River Road. Direct overlap of the Work of these Tenders is not expected.
- (c) Traffic Signals- Traffic Signals Branch will be responsible for coordinating removal of above ground plant and cabling to facilitate the installation of the underground plant. The Contractor must coordinate with Traffic Signals such that the signals operations at each intersection are maintained except where permitted by the Contract Administrator and Traffic Signals Branch. This may result in work being completed in multiple stages.
- (d) Manitoba Hydro- relocation of street lighting, adjustment of manholes, and safety watch as required.
- (e) BellMTS- adjustments to manholes and pedestal relocation(s).
- (f) Shaw and Telus vaults to be adjusted.
- (g) Winnipeg Transit- temporary relocation of bus stops, relocation of bus stop furniture and shelters;
- (h) City of Winnipeg Traffic Services - supply of signs as necessary, line painting, setup of traffic control for the Manitoba Marathon and Winnipeg Blue Bombers games;
- (i) Winnipeg Blue Bombers/ Valour Football Club - Traffic, cycling and pedestrian control during games at Princess Auto Stadium;
 - (i) Winnipeg Blue Bombers 2025 schedule can be found at www.bluebombers.com/schedule/2025/;
 - (ii) Valour Football Club 2025 schedule can be found at <https://valourfc.canpl.ca/schedule>;
 - (iii) Note that game schedules are subject to change; and
- (j) City of Winnipeg Geomatics Branch – various work on survey infrastructure.

D24.2.1 Further to D26.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others identified in D26.1 and accommodate the necessary area on Site required for the Work by Others to complete the Work.

D25. SEQUENCE OF WORK

D25.1 Further to C6.1, the sequence of work shall be as follows:

D25.1.1 A recommended traffic staffing plan has been included in E1.4 and is generally as follows:

- (i) 2025: Construction of temporary median works on Pembina Highway;
- (ii) 2025: Construction of the southbound lanes of Pembina Highway and loops and ramps on the west side of the interchange including new EB ramp alignment tying into University Crescent;
- (iii) Winter of 2025-26: All lanes of traffic are open to the public;
- (iv) 2026: Construction of the northbound lanes of Pembina Highway and the loops and ramps on the east side of the interchange; and
- (v) 2026: Restoration of Pembina Highway median.

D25.1.2 Placing the topsoil and finished grading of all boulevard areas shall be completed prior to construction of asphaltic concrete overlays.

D26. CRITICAL STAGES

D26.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) Southbound Bridge Deck Concrete Placement Complete by September 15, 2025.
- (b) Southbound to Westbound Ramp Rehabilitation shall be completed within forty-two (42) consecutive Calendar Days and be completed by October 15, 2025. In accordance with E9.3.1(c), this Critical Stage cannot be completed concurrently with D28.1(c).
- (c) Southbound to Eastbound Loop Rehabilitation shall be completed within forty-two (42) consecutive Calendar Days and be completed by October 15, 2025. In accordance with E9.3.1(c), this Critical Stage cannot be completed concurrently with D28.1(b).
- (d) Eastbound to Chancellor Drive Ramp shall only be closed to traffic for forty-two (42) Calendar Days.
- (e) Stage 1 Complete by October 15, 2025.
- (f) Northbound to Eastbound Ramp Rehabilitation shall be completed within forty-two (42) consecutive Calendar Days in 2026. In accordance with E9.3.1(d), this Critical Stage cannot be completed concurrently with D28.1(g).
- (g) Northbound to Westbound Loop Rehabilitation shall be completed within forty-two (42) consecutive Calendar Days in 2026. In accordance with E9.3.1(d), this Critical Stage cannot be completed concurrently with D28.1(f).
- (h) Northbound Bridge Deck Concrete Placement Complete by September 15, 2026.

D26.2 When the Contractor considers the Work associated with Critical Stages to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D26.3 The date on which the Critical Stage Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the Critical Stage has been achieved.

D27. SUBSTANTIAL PERFORMANCE

D27.1 The Contractor shall achieve Substantial Performance by October 2, 2026.

D27.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for

purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

- D27.3 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.

D28. TOTAL PERFORMANCE

- D28.1 The Contractor shall achieve Total Performance by October 16, 2026.
- D28.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.
- D28.3 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.

D29. LIQUIDATED DAMAGES

- D29.1 If the Contractor fails to achieve Critical Stages, Substantial Performance, or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:
- (a) Each Critical Stage as defined in D28.1(a) through D28.1(h) – Ten Thousand dollars (\$10,000);
 - (b) Substantial Performance – Ten Thousand dollars (\$10,000);
 - (c) Total Performance – Two Thousand dollars (\$2,000).
- D29.2 The amount specified for liquidated damages in D31.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Critical Stages, Substantial Performance, or Total Performance by the days fixed herein for same.
- D29.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D30. SUPPLY CHAIN DISRUPTION SCHEDULE DELAYS

- D30.1 The City acknowledges that the schedule for this Contract may be impacted by the Supply Chain Disruption. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the delivery requirements and schedule identified in the Contract in close consultation with the Contract Administrator.
- D30.2 If the Contractor is delayed in the performance of the Work by reason of the Supply Chain Disruption, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.
- D30.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether a Supply Chain Disruption will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to a Supply Chain Disruption, including but not limited to ordering of Material or Goods, production and/or manufacturing schedules or availability of staff as appropriate.

- D30.4 For any delay related to Supply Chain Disruption and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D32.3. Failure to provide this notice will result in no additional time delays being considered by the City.
- D30.5 The Work schedule, including the durations identified in D28 to D30 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.
- D30.6 Where Work not previously identified is being carried over solely as a result of delays related to Supply Chain Disruption, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to Supply Chain Disruption, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.
- D30.7 Any time or cost implications as a result of Supply Chain Disruption and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D31. SCHEDULED MAINTENANCE

- D31.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Sod maintenance as specified in CW 3510; and
 - (b) Reflective crack maintenance during the warranty period as specified in CW 3250.
- D31.2 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

D32. JOB MEETINGS

- D32.1 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.
- D32.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

D33. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D33.1 Further to C6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D34. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

- D34.1 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 their sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4.

D35. LAYOUT OF THE STRUCTURAL WORKS

- D35.1 The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Structural Work.
- D35.2 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. He shall provide all required instruments and competent personnel for performing all layouts.
- D35.3 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.
- D35.4 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at his own expense.
- D35.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

D36. LAYOUT OF THE ROAD WORKS

- D36.1 Further to the City of Winnipeg Specifications GC 6.28(h), the Contract Administrator shall mark, to the extent determined to be necessary, the location, alignment and elevation of the Work by means of stakes or marks, and the Contractor shall make the completed Works conform to the lines and marks thus indicated.
- D36.2 Stakes and marks required shall be provided no later than one (1) Business Day following the day on which the Contractor request such stakes, and/or marks, except where the Contractor's request is made immediately following asphalt planning operations. Then the Contract Administrator may require a maximum of two (2) Business Days to provide stakes and marks as a result of required adjustments to final design grades.
- D36.3 The Contractor shall notify the Contract Administrator immediately of the disturbance of any such stakes or marks. The cost of correcting any errors arising out of neglect of the Contractor to so notify the Contract Administrator shall be borne entirely by the Contractor, as well as the cost of replacing any disturbed stakes or marks.
- D36.4 Before commencing Work, the Contractor shall satisfy themselves as to the meaning and correctness of all stakes and marks and no claims shall be entertained by the City on account of any alleged inaccuracies. If any error is suspected in the Drawings, Specifications or the directions of the Contract Administrator, Work shall be discontinued until the errors are rectified, but no claims shall be made on account of any delay occasioned thereby.
- D36.5 The Contractor shall determine and provide all dimensions and elevations measured from the stakes or marks.

MEASUREMENT AND PAYMENT

D37. PAYMENT

- D37.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until

the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

D38. PAYMENT SCHEDULE

D38.1 Further to C12, payment shall be in accordance with the following payment schedule:

- (a) Portions of Work designated for Lump Sum payment will be paid for on a monthly prorated basis as determined by the Contract Administrator in consultation with the Contractor provided the portion of the Work to be paid for has been permanently incorporated into the Works.

D39. FUEL PRICE ADJUSTMENT

D39.1 The Contract is subject to a fuel price adjustment which will be calculated monthly based on eligible Work completed utilizing the following mathematical formulas:

- (a) where the price of fuel has increased - $((CFI/BFI)-1.15) \times Q \times FF$; and
- (b) where the price of fuel has decreased - $((CFI/BFI)-0.85) \times Q \times FF$; where
 - (i) BFI = base fuel index
 - (ii) CFI = current fuel index
 - (iii) FF = fuel factor
 - (iv) Q = monetary value of Work applied in the calculation.

D39.1.1 Eligible Work will be determined in accordance with D41.5.

D39.1.2 The base fuel index (BFI) will be the retail price of fuel identified on the Submission Deadline based on latest published "Monthly average retail prices for gasoline and fuel by geography" for Winnipeg, published by [Statistics Canada, Table 18-10-0001-01](#). The BFI is a blended rate based on 15% regular unleaded gasoline at self-service filling stations and 85% diesel fuel at self-service filling stations.

D39.1.3 The current fuel index (CFI) based on the above blended rate will be determined for each monthly progress estimate and applied on the following progress estimate as a change order once rates are published by Statistics Canada.

D39.1.4 A Fuel Factor (FF) rate of the monetary value of all eligible Work completed that month based on the Contract unit prices will be used to calculate the assumed apportioned cost of fuel.

D39.2 Fuel cost adjustments may result in additional payment to the Contractor or credit to the City within the Contract by way of a monthly change order.

D39.3 The fuel escalation or de-escalation adjustment will not be applied if the CFI is within $\pm 15\%$ of the BFI.

D39.4 Fuel escalation adjustments will not be considered beyond the Substantial Performance/Critical Stages except where those dates/Working Days are adjusted by change order. Fuel de-escalation adjustments will apply for Work that extends beyond the dates/Working Days specified for Substantial Performance/Critical Stages.

D39.5 The Fuel Factor (FF) rates will be set as follows:

- (a) The Fuel Factor rate shall be set at 2.7% of the monetary value of all Work based on unit prices except for the portions of the Contract identified below;
- (b) The Fuel Factor rate will be set at 1.9% of the monetary value for Section A - Structural Works identified on Form B: Prices related to bridges and structures Work.
- (c) The Fuel Factor will not apply to Section M - water and Waste Work, Section N - Traffic Signals Work, or Section O – Mobilization / Demobilization identified on Form B: Prices.

WARRANTY

D40. WARRANTY

- D40.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter, except where longer warranty periods are specified in the respective Specification sections, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.
- (a) For the purpose of contract security, the warranty period shall be two (2) years.
- D40.2 Notwithstanding C13.2, 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 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.
- (a) In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

DISPUTE RESOLUTION

D41. DISPUTE RESOLUTION

- D41.1 If the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator, the Contractor shall act in accordance with the Contract Administrator's opinion, determination, or decision unless and until same is modified by the process followed by the parties pursuant to D43.
- D41.2 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted"
- D41.3 The entire text of C21.5 is deleted, and amended to read:
- (a) If Legal Services has determined that the Disputed Matter may proceed in the Appeal Process, the Contractor must, within ten (10) Business Days of the date of the Legal Services Response Letter, submit their written Appeal Form, in the manner and format set out on the City's Purchasing Website, to the Chief Administrative Officer, and to the Contract Administrator. The Contractor may not raise any other disputes other than the Disputed Matter in their Appeal Form.
- D41.4 Further to C21, prior to the Contract Administrator's issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator ("Dispute"):
- (a) In the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor's equivalent representative to resolve Disputes within the normal course of project dealings between the Contract Administrator and the Contractor's equivalent representative.
- (b) Disputes which in the reasonable opinion of the Contract Administrator or the Contractor's equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:
- (i) The Contract Administrator;
- (ii) Supervisory level between the Contract Administrator and applicable Department Head;
- (iii) Department Head.
- D41.4.1 Names and positions of Contractor representatives equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.

- D41.4.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.
- D41.4.3 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.
- D41.4.4 If the Dispute is not resolved to the City and Contractor's mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D43.4.3, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

INDEMNITY

D42. INDEMNITY

- D42.1 Indemnity shall be as stated in C17.
- D42.2 Notwithstanding C17.1, the Contractor shall save harmless and indemnify the City in the amount of twice the Contract Price or five million dollars (\$5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the Contractor, their Subcontractors, employees or agents in the performance or purported performance of the Work, and more particularly from:
- (a) accidental injury to or death of any person whether retained by or in the employ of the contractor or not, arising directly or indirectly by reason of the performance of the Work, or by reason of any trespass on or damage to property;
 - (b) damage to any property owned in whole or in part by the City, or which the City by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, repair or maintain;
 - (c) damage to, or trespass or encroachment upon, property owned by persons other than the City;
 - (d) any claim for lien or trust claim served upon the City pursuant to The Builders' Liens Act;
 - (e) failure to pay a Workers Compensation assessment, or Federal or Provincial taxes;
 - (f) unauthorized use of any design, device, material or process covered by letters patent, copyright, trademark or trade name in connection with the Work;
 - (g) inaccuracies in any information provided to the City by the Contractor.
- D42.3 Further to C17, The City shall save harmless and indemnify the Contractor in the amount of twice the Contract Price or five million dollars (\$5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the City, their employees or agents in the performance of its obligation under the Contract.

THIRD PARTY AGREEMENTS

D43. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

- D43.1 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.
- D43.2 For the purposes of D45:
- (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.

D43.3 Indemnification By Contractor

- D43.3.1 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.
- D43.3.2 The Contractor agrees that in no event will Canada or Manitoba, their respective officers, servants, employees or agents be held liable for any damages in contract, tort (including negligence) or otherwise, for:
- (a) any injury to any person, including, but not limited to, death, economic loss or infringement of rights;
 - (b) any damage to or loss or destruction of property of any person; or
 - (c) any obligation of any person, including, but not limited to, any obligation arising from a loan, capital lease or other long term obligation;
- in relation to this Contract or the Work.

D43.4 Records Retention and Audits

- D43.4.1 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.
- D43.4.2 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 D45.4.1 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.

D43.5 Other Obligations

- D43.5.1 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.
- D43.5.2 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.

- D43.5.3 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.
- D43.5.4 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.
- D43.5.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.
- D43.5.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

ADJUSTMENTS FOR CHANGES IN LAWS, TAXES, OR TARIFFS

D44. ADJUSTMENTS FOR CHANGES IN LAWS, TAXES, OR TARIFFS

- D44.1 Further to C12.4 and subject to C6.13, the Contract Price shall be adjusted if any change in a law or tax imposed under the Excise Act, the Excise Tax Act, the Customs Act, the Customs Tariff, The Mining Tax Act (Manitoba), or The Retail Sales Tax Act (Manitoba), by an act of the Congress of the United States of America, or by Executive Order by the President of the United States under the International Emergency Economic Powers Act of the United States of America or similar legislation:
- a) occurs after the Submission Deadline;
 - (b) applies to Material; and
 - (c) affects the cost of that Material to the Contractor.
- D44.2 Further to C12.5, if a change referred to in C12.4 occurs, the Contract Price shall be increased or decreased by an amount equal to the amount that is established, by an examination of the relevant records of the Contractor, to be the increase or decrease in the cost incurred that is directly attributable to that change, and which the Contractor has proven to the Contract Administrator represents the minimum amount of increase necessary in order to obtain necessary Material or Plant. For the avoidance of doubt, the Contractor shall be required to provide satisfactory proof that it has investigated alternative options for obtaining equivalent Material or Plant and reducing or eliminating the increase in Contract Price, up to and including entering into purchase agreements with vendors located in other jurisdictions, in order for Contractor to be able to avail itself of the increase in Contract Price permitted

[illegible]

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 their entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B7. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B7.
- E1.4 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
<u>Roadworks</u>	
<u>General</u>	
P-3590-1	Cover Sheet – Location Plan
P-3590-2	Drawing List
<u>Removals</u>	
P-3590-3	Removals 1 of 17
P-3590-4	Removals 2 of 17
P-3590-5	Removals 3 of 17
P-3590-6	Removals 4 of 17
P-3590-7	Removals 5 of 17
P-3590-8	Removals 6 of 17
P-3590-9	Removals 7 of 17
P-3590-10	Removals 8 of 17
P-3590-11	Removals 9 of 17
P-3590-12	Removals 10 of 17
P-3590-13	Removals 11 of 17
P-3590-14	Removals 12 of 17
P-3590-15	Removals 13 of 17
P-3590-16	Removals 14 of 17
P-3590-17	Removals 15 of 17
P-3590-18	Removals 16 of 17
P-3590-19	Removals 17 of 17
<u>Horizontal Geometry</u>	
P-3590-20	Pembina Highway – STA 0+100 SB to STA 0+220 SB
P-3590-21	Pembina Highway – STA 0+220 SB to STA 0+350 SB
P-3590-22	Pembina Highway – STA 0+350 SB to STA 0+480 SB
P-3590-23	Pembina Highway – STA 0+480 SB to STA 0+610 SB
P-3590-24	Pembina Highway – STA 0+610 SB to STA 0+740 SB
P-3590-25	Pembina Highway – STA 0+740 SB to STA 0+870 SB
P-3590-26	Pembina Highway – STA 0+870 SB to STA 0+960 SB
P-3590-27	Eastbound Ramp to University Crescent – STA 0+270 to STA 0+510
P-3590-28	Eastbound Ramp to University Crescent – STA 0+510 to STA 0+750

P-3590-29	Service Road – STA 0+070 to STA 0+190
P-3590-30	Service Road – STA 0+190 to STA 0+315
<u>Paving and Grading</u>	
P-3590-31	Pembina Highway – Southbound – Chancellor Dr to Sta 0+260 SB
P-3590-32	Pembina Highway – Southbound – STA 0+260 SB to STA 0+380 SB
P-3590-33	Pembina Highway – Southbound – STA 0+380 SB to STA 0+510 SB
P-3590-34	Pembina Highway – Southbound – STA 0+510 SB to STA 0+630 SB
P-3590-35	Pembina Highway – Southbound – STA 0+630 SB to STA 0+750 SB
P-3590-36	Pembina Highway – Southbound – STA 0+750 SB to STA 0+860 SB
P-3590-37	Pembina Highway – Southbound – STA 0+860 SB to Plaza Dr
P-3590-38	Eastbound Ramp to University Crescent – Abinojii Mikanah to STA 0+390
P-3590-39	Eastbound Ramp to University Crescent – STA 0+390 to STA 0+510
P-3590-40	Eastbound Ramp to University Crescent – STA 0+510 to STA 0+610
P-3590-41	Eastbound Ramp to University Crescent – STA 0+610 to STA 0+750
P-3590-42	Southbound to Eastbound Ramp – Abinojii Mikanah to STA 0+220
P-3590-43	Southbound to Eastbound Ramp – STA 0+220 to STA 0+360
P-3590-44	Southbound to Eastbound Ramp – STA 0+360 to Pembina Highway
P-3590-45	Southbound to Westbound Ramp – Abinojii Mikanah to STA 0+290
P-3590-46	Southbound to Westbound Ramp – STA 0+290 to STA 0+430
P-3590-47	Southbound to Westbound Ramp – STA 0+430 to Pembina Highway
P-3590-48	Service Road – Chancellor Dr to STA 0+190
P-3590-49	Service Road – STA 0+190 to STA 0+315
P-3590-50	Chancellor Drive – STA 0+030 to STA 0+150
P-3590-51	Pembina Highway – Northbound – STA 0+090 NB to STA 0+210 NB
P-3590-52	Pembina Highway – Northbound – STA 0+210 NB to STA 0+310 NB
P-3590-53	Pembina Highway – Northbound – STA 0+310 NB to STA 0+430 NB
P-3590-54	Pembina Highway – Northbound – STA 0+430 NB to STA 0+550 NB
P-3590-55	Pembina Highway – Northbound – STA 0+550 NB to STA 0+660 NB
P-3590-56	Pembina Highway – Northbound – STA 0+660 NB to STA 0+790 NB
P-3590-57	Pembina Highway – Northbound – STA 0+790 NB to Plaza Dr
P-3590-58	Westbound to Northbound/Southbound Ramp – Pembina Highway to STA 0+240
P-3590-59	Westbound to Northbound/Southbound Ramp – STA 0+240 to STA 0+350
P-3590-60	Westbound to Northbound/Southbound Ramp – STA 0+350 to STA 0+460
P-3590-61	Northbound to Eastbound Ramp – Pembina Highway to STA 0+210
P-3590-62	Northbound to Eastbound Ramp – STA 0+210 to STA 0+330
P-3590-63	Northbound to Eastbound Ramp – STA 0+330 to Abinojii Mikanah
P-3590-64	Northbound to Westbound Ramp – Pembina Highway to STA 0+200
P-3590-65	Northbound to Westbound Ramp – STA 0+200 to STA 0+310
P-3590-66	Northbound to Westbound Ramp – STA 0+310 to Abinojii Mikanah
P-3590-67	University Crescent – Westbound – Pembina Highway to STA 0+760
<u>Sections and Details</u>	
P-3590-68	Sections – A, B, C & D
P-3590-69	Sections – E, F, G, H, I & J
P-3590-70	Details
<u>Overhead Sign</u>	
<u>Structures</u>	
P-3590-71	NB Pembina Highway – General Arrangement (S659)
P-3590-72	Fabrication Details (S659)
P-3590-73	EB to University Ramp – General Arrangement (S802)
P-3590-74	Fabrication Details 1 of 2 (S802)
P-3590-75	Fabrication Details 2 of 2 (S802)
P-3590-76	NB Pembina Highway – General Arrangement (S648)
P-3590-77	SB Pembina Highway – General Arrangement (S650)
P-3590-78	Concrete Pile Modification Details (S650)
P-3590-79	NB Pembina Highway – General Arrangement (S803)
P-3590-80	Fabrication Details (S803)
P-3590-81	SB Pembina Highway – General Arrangement (S647)
P-3590-82	SB Pembina Highway – General Arrangement (S804)
P-3590-83	Fabrication Details 1 of 2 (S804)

P-3590-84

P-3590-85

P-3590-86

P-3590-87

Structural Works

B215-25-1

B215-25-2

B215-25-3

B215-25-4

B215-25-5

B215-25-6

B215-25-7

B215-25-8

B215-25-9

B215-25-10

B215-25-11

B215-25-12

B215-25-13

B215-25-14

B215-25-15

B215-25-16

B215-25-17

B215-25-18

B215-25-19

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B215-25-21

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B215-25-25

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B215-25-27

B215-25-28

B215-25-29

B215-25-30

B215-25-31

Traffic Signage &
Staging

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

Figure 20

Figure 21

Fabrication Details 2 of 2 (S804)

WB University Crescent – General Arrangement (S797)

EB to University Ramp – General Arrangement Ground Mounted Sign

Quadguard Layout – Plans and Details

General Notes

Scope of Work

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Typical Concrete Repair Details

Abutment Repairs

Pier 1 – Concrete Sealing

Pier 2 – Concrete Sealing

Pier 3 – Concrete Sealing

Reinforcing Cover Survey

Construction and Traffic Staging 1 of 2

Construction and Traffic Staging 2 of 2

Abutment Shear Block Details

Deck and Abutment Removals

Deck and Abutment Modifications 1 of 3

Deck and Abutment Modifications 2 of 3

Deck and Abutment Modifications 3 of 3

Approach Slab Removals

Approach Slab Modifications 1 of 3

Approach Slab Modifications 2 of 3

Approach Slab Modifications 3 of 3

Expansion Joint Details 1 of 2

Expansion Joint Details 2 of 2

Curb Details

Median Details

Traffic Barrier Layout

Traffic Barrier Reinforcing & Details 1 of 2

Traffic Barrier Reinforcing & Details 2 of 2

Bicycle Rail Details 1 of 3

Bicycle Rail Details 2 of 3

Bicycle Rail Details 3 of 3

Bill of Reinforcing

Drawing List, Legend and General Notes

Stage 1- 2025 (1 of 3)

Stage 1- 2025 (2 of 3)

Stage 1- 2025 (3 of 3)

Stage 2- 2025 (1 of 5)

Stage 2- 2025 (2 of 5)

Stage 2- 2025 (3 of 5)

Stage 2- 2025 (4 of 5)

Stage 2- 2025 (5 of 5)

Stage 3- 2025 (1 of 4)

Stage 3- 2025 (2 of 4)

Stage 3- 2025 (3 of 4)

Stage 3- 2025 (4 of 4)

Stage 4- 2025 (1 of 5)

Stage 4- 2025 (2 of 5)

Stage 4- 2025 (3 of 5)

Stage 4- 2025 (4 of 5)

Stage 4- 2025 (5 of 5)

Stage 5- 2025 (1 of 5)

Stage 5- 2025 (2 of 5)

Stage 5- 2025 (3 of 5)

Figure 22	Stage 5- 2025 (4 of 5)
Figure 23	Stage 5- 2025 (5 of 5)
Figure 24	Stage 6- 2025 (1 of 3)
Figure 25	Stage 6- 2025 (2 of 3)
Figure 26	Stage 6- 2025 (3 of 3)
Figure 27	Stage 7- 2025 (1 of 1)
Figure 28	Stage 8- 2026 (1 of 4)
Figure 29	Stage 8- 2026 (2 of 4)
Figure 30	Stage 8- 2026 (3 of 4)
Figure 31	Stage 8- 2026 (4 of 4)
Figure 32	Stage 9- 2026 (1 of 4)
Figure 33	Stage 9- 2026 (2 of 4)
Figure 34	Stage 9- 2026 (3 of 4)
Figure 35	Stage 9- 2026 (4 of 4)
Figure 36	Stage 10- 2026 (1 of 5)
Figure 37	Stage 10- 2026 (2 of 5)
Figure 38	Stage 10- 2026 (3 of 5)
Figure 39	Stage 10- 2026 (4 of 5)
Figure 40	Stage 10- 2026 (5 of 5)
Figure 41	Stage 11- 2026 (1 of 4)
Figure 42	Stage 11- 2026 (2 of 4)
Figure 43	Stage 11- 2026 (3 of 4)
Figure 44	Stage 11- 2026 (4 of 4)
Figure 45	Stage 12- 2026 (1 of 3)
Figure 46	Stage 12- 2026 (2 of 3)
Figure 47	Stage 12- 2026 (3 of 3)
Figure 48	Stage 13- 2026 (1 of 3)
Figure 49	Stage 13- 2026 (2 of 3)
Figure 50	Stage 13- 2026 (3 of 3)
Figure 51	Stage 14- 2026 (1 of 3)
Figure 52	Stage 14- 2026 (2 of 3)
Figure 53	Stage 14- 2026 (3 of 3)

E1.5 The following drawings and drawing packages are provided for the Contractor's reference:

- (a) Bishop Grandin Blvd. Extension Waverley Street to Red River Pembina Highway Overpass
P.D. No. 88-244
- (b) OHHS-1990 Bishop Grandin Ext Waverley St to Red River, Drawing U230-90-R101
- (c) OHSS-1990 Bishop Grandin Ext Waverley St to Red River, Drawing U230-90-R102
- (d) OHSS Maintenance Works – 2004 Program
- (e) Steel Overhead Sign Support Structures – 2013 Maintenance Works 2013 Program, Bid
Opportunity No. 449-2013
- (f) Pembina Hwy Overpass (Route 165) 2014 Bridge Deck & Miscellaneous Concrete
Repairs, Bid Opportunity No. 565-2014
- (g) Steel Overhead Sign Support Structures – 2015 Maintenance Works, Bid Opportunity 537-
2015

E2. SHOP DRAWINGS

E2.1 Description

E2.1.1 This Specification provides instructions for the preparation and submission of Shop Drawings.

E2.1.2 This Specification shall revise, amend, and supplement the requirements of CW 1110.

- E2.1.3 The Contractor shall provide all Submittals and Shop Drawings required in the Contract as well as any additional Submittals reasonably requested by the Contract Administrator, at the Contractor's expense.
- E2.1.4 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work.
- E2.1.5 Original drawings are to be prepared by the Contractor, subcontractor, supplier, distributor, or manufacturer, which illustrate the appropriate portion of Work; showing fabrication, layout, setting, or erection details as specified in appropriate sections.
- E2.1.6 Shop Drawings are required for the following components:
- (a) Temporary Protection System;
 - (b) Expansion Joints;
 - (c) Galvanic Anode System;
 - (d) Aluminum Pedestrian Handrail / Bicycle Rail
 - (e) Anchorage Assemblies for Future Anti-Debris Screen;
 - (f) Stainless Steel Reinforcing Steel;
 - (g) Overhead Sign Support Structures; and
 - (h) Sign Panels.
- E2.2 Scope of Work
- E2.2.1 The Work under this Specification shall include review of Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
- E2.2.2 The Contractor shall provide all Submittals and Shop Drawings required in the Contract as well as any additional Submittals reasonably requested by the Contract Administrator, at the Contractor's expense.
- (a) field measurements;
 - (b) field construction criteria;
 - (c) catalogue numbers and similar data.
- E2.2.3 Coordinate each shop drawing submission with the requirements of the Work and Contract Documents. Shop Drawings of separate components of a larger system will not be reviewed until all related drawings are available.
- E2.2.4 Notify Contract Administrator, in writing at time of shop drawing submission, of deviations from requirements of Contract Documents.
- E2.2.5 Responsibility for deviations in Shop Drawing submission from requirements of Contract Documents is not relieved by the Contract Administrator's review of submission, unless the Contract Administrator gives written acceptance of specified deviations.
- E2.2.6 Responsibility for errors and omissions in the shop drawing submission is not relieved by the Contract Administrator's review of the submittals.
- E2.2.7 The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on the previous submission.
- E2.2.8 After the Contract Administrator has reviewed and returned the copies, distribute the copies to sub-trades as appropriate.

- E2.2.9 Maintain one (1) complete set of reviewed Shop Drawings, filed by Specification section number, at the Site for use and reference by the Contract Administrator and Subcontractors.
- E2.3 Submittals
- E2.3.1 The Contractor shall schedule submittals at least ten (10) Business Days prior to when reviewed submittals will be needed, and allow for a ten (10) Business Day period for review by the Contract Administrator or each individual submission and re-submission, unless otherwise noted in the Contract.
- E2.3.2 Submit one (1) electronic PDF of Shop Drawings.
- E2.3.3 Further to CW 1110, all submissions must be in metric units. Where data is in imperial units, the correct metric values shall also be shown on the submissions for Contract Administrator review.
- E2.3.4 Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.
- E2.3.5 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions, and review of Shop Drawings.
- E2.3.6 Only two (2) reviews of Shop Drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator's scheduled rates and at the discretion of the Contract Administrator. The Contract Administrator's charges for the additional Work will be deducted from the Contractor's Progress Certificates.
- E2.3.7 Accompany shop drawing submissions with a transmittal letter containing:
- (a) Date;
 - (b) project title and bid opportunity number;
 - (c) Contractor's name and address;
 - (d) number of each Shop Drawing, product data, and sample submitted;
 - (e) specification section, title, number, and clause;
 - (f) drawing number and detail/section number;
 - (g) other pertinent data.
- E2.3.8 Shop drawing submissions shall include:
- (a) date and revision dates;
 - (b) project title and bid opportunity number;
 - (c) name of:
 - (i) Contractor;
 - (ii) Subcontractor;
 - (iii) supplier;
 - (iv) manufacturer;
 - (v) separate detailer when pertinent.
 - (d) identification of product or material;
 - (e) relation to adjacent structure or materials;
 - (f) field dimensions, clearly identified as such;
 - (g) specification section name, number and clause number or drawing number and detail/section number;
 - (h) applicable standards, such as CSA or CGSB numbers;

- (i) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements, and compliance with Contract Documents.

E2.3.9 Shop Drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

- (a) Temporary Protection System;
- (b) All Formwork Details, as requested by the Contract Administrator;
- (c) Metal Fabrications, Layout, and Erection Details for Overhead Sign Support Structures;
- (d) Metal Fabrication, Layout and Erection Details for Expansion Joints;

E2.4 Equipment

E2.4.1 General

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

E2.5 Measurement and Payment

E2.5.1 Shop Drawings will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E2.5.2 Material and equipment delivered to the Site will not be paid for until pertinent Shop Drawings have been submitted and reviewed.

E2.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

E3. BACKGROUND REPORTS

E3.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions. The Geotechnical Report is contained in Appendix 'A'.

E3.2 Further to C3.1, the condition assessment reports are provided to aid the Contractor's evaluation of the existing structure conditions. The Condition Assessment Reports are contained in Appendix 'B'.

GENERAL REQUIREMENTS

E4. OFFICE FACILITIES

E4.1 Description

E4.1.1 This Specification shall cover all operations relating to the supply and maintenance of office facilities at the Site for use by the Contract Administrator.

E4.1.2 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 Work as hereinafter specified.

E4.2 Scope of Work

E4.2.1 The Contractor shall supply office facilities meeting the following requirements:

- (a) The field office shall be for the exclusive use of the Contract Administrator.
- (b) The building shall be conveniently located near the site of the Work.

- (c) The building shall have a minimum floor area of 80 square metres, a height of 2.4 meters. Each building shall have two (2) windows for cross ventilation and a door entrance with a suitable lock.
- (d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either sixteen to eighteen degrees Celsius (16-18°C) or twenty-four to twenty-five degrees Celsius (24-25°C).
- (e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three (3) wall outlets.
- (f) The building shall be furnished with two (2) desks with chairs, one (1) drafting table with a stool, a table with chairs suitable to seat at least fifteen (15) people at a time for meetings, one (1) four (4) drawer, lockable legal size filing cabinet, and a minimum of fifteen (15) chairs;
- (g) The field office (s) combined shall be equipped with a water cooler and be supplied so as never to run out of water. They shall be equipped with one (1) fridge, one (1) microwave, one (1) coffee maker, and one (1) electric kettle;
- (h) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.
- (i) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.

E4.2.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E4.2.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance is completed.

E4.3 Materials

E4.3.1 General

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

E4.4 Equipment

E4.4.1 General

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

E4.5 Measurement and Payment

E4.5.1 Office facilities will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E5. MOBILIZATION AND DEMOBILIZATION PAYMENT

E5.1 Description

E5.1.1 This Specification covers 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 Work as hereinafter specified

E5.2 References

E5.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) CW 1120 – Existing Services, Utilities and Structures;
- (b) CW 1130 – Site Requirements;
- (c) Specification E4, Office Facilities;
- (d) Specification E8, Traffic Control; and
- (e) Specification E9, Traffic Management.

E5.3 Scope of Work

E5.3.1 The Work under this Specification shall include but not be limited to:

- (a) Mobilizing and demobilizing on-site Work facilities;
- (b) Supplying, setting up, layout out, and removing site office facilities as detailed in E4;
- (c) Supplying and installing secure fencing/gates for portions of the laydown areas the Contractor wishes to secure;
- (d) Maintaining and removing any access roadways as needed into the laydown areas;
- (e) Traffic Control (E8), and Traffic Management (E9).

E5.4 Submittals

E5.4.1 The Contractor shall submit the following to the Contract Administrator seven (7) Calendar Days prior to mobilization on Site:

- (a) A plan highlighting the Site layout which includes: laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits and gate locations for review and approval.

E5.5 Materials

E5.5.1 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.

E5.6 Equipment

E5.6.1 General

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

E5.7 Construction Methods

E5.7.1 Layout of On-Site Work Facilities

- (a) The Contractor shall mobilize all on-site Work and other temporary facilities.
- (b) Upon completion of construction activities, the Contractor shall remove all on-site Work and other temporary facilities.

E5.7.2 Site Security

- (a) The Contractor has discretion on what areas of the site they wish to secure. This may include the Contractor's lay down area, material storage areas, and/or access roads. These areas may be fenced and gated for security and to discourage pedestrian entrance to construction areas and to control any potential hazard to the public, particularly children. The Contractor shall not fence off areas where public traffic or pedestrians need to travel, such as open roadway lanes or sidewalks/bike paths.

E5.7.3 Access Roadway

- (a) Access roadways shall be identified in the Contractor's site plan, as per D23.
- (b) The Contractor shall maintain any access roadway they install.
- (c) Upon completion of the Work, the area shall be restored to its original condition.

E5.7.4 Restoration of Existing Facilities

- (a) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities to their original condition, to the approval of the Contract Administrator.

E5.8 Quality Control and Assurance

E5.8.1 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.

E5.8.2 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.

E5.9 Measurement and Payment

E5.9.1 Mobilization and Demobilization

- (a) "Mobilization and Demobilization" will not be measured. This Item of Work will be paid for at a percentage of the Contract Lump Sum Price, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator. These percentages shall be as follows:
 - (i) when Contract Administrator is satisfied that 2025 construction has commenced; fifteen percent (15%);
 - (ii) when Contract Administrator is satisfied that 2026 construction has commenced; fifteen percent (15%);
 - (iii) during construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator; sixty percent (60%); and
 - (iv) upon Total Performance; ten percent (10%).

E6. PROTECTION OF TREES

E6.1 Description

E6.1.1 This Specification shall cover all operations relating to the protection of existing trees.

E6.1.2 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 Work as hereinafter specified.

E6.2 Scope of Work

E6.2.1 The Work under this Specification shall include the following precautionary steps to prevent damage from construction activities to existing trees within the limits of the construction area:

- (a) The Contractor will field-verify the presumed limits of work indicated on the Drawings and flag all trees that require pruning or removal to facilitate the work, subject to the Contract Administrator's approval. Above ground clearance for overhanging branches in the work zone must be anticipated. No trees may be removed or pruned without written approval from the Contract Administrator. Forestry Branch will conduct an appraisal of affected trees concurrently with the Contract Administrator's review.
- (b) Trees within or adjacent to a construction area that are not approved for removal by the Contract Administrator must be protected during construction by means of a barrier surrounding the Tree Protection Zone (TPZ) as outlined in E6.2.4. Activities that are likely to injure or destroy the tree are not permitted within the TPZ.
- (c) Tree pruning or root pruning of City of Winnipeg owned trees may only be done by a Contractor approved by the project's Qualified Tree Consultant (refer to E6.2.7) or Urban Forestry Branch.
- (d) No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.
- (e) No City of Winnipeg tree or tree protected by a City of Winnipeg by-law may be removed without the written permission of the City of Winnipeg.
- (f) Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Contact the Forestry Branch for consultation on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.
- (g) American elm trees are not to be pruned between April 1 and August 1 and Siberian elm trees between April 1 and July 1 of any year under provisions of The Dutch Elm Disease Act.

E6.2.2 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 Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist licence or by the Forestry Branch.

E6.2.3 The Contractor shall remove and replace any trees deemed to have died or that are dying due to damage from carelessness during construction. Removal and replacement costs will be determined by size, market price of the largest transplantable tree of same or different species and may include appraised value of existing tree as determined by current International Society of Arboriculture evaluation procedure presently used by Forestry Branch in conjunction with City Claims Branch. For reference, the estimated replacement cost of a 600 mm diameter American elm on a boulevard based on this appraisal system is approximately \$27,000.00.

E6.2.4 Tree Protection Zone

- (a) The following is a chart showing optimal distances for determining a tree protection zone (the roots of a tree can extend from the trunk to approximately two (2) to three (3) times the distance of the drip line). Some site conditions may dictate the need for a smaller TPZ. The City of Winnipeg Urban Forestry Branch must be notified in these instances. Forestry will determine if the smaller TPZ is acceptable in the specific circumstance and advise of any additional tree protection or removal requirements.

Table E6-2: Tree Protection Zones

Trunk Diameter (DBH)	Minimum Protection Distances Required
<10 cm	2.0 m
11-40 cm	2.4 m
41-50 cm	3.0 m
51-60 cm	3.6 m
61-70 cm	4.2 m
71-80 cm	4.8 m
81-90 cm	5.4 m
91-100 cm+	6.0 m

- (b) Diameter at breast height (DBH) measurement of tree trunk is taken at 1.4 m above ground.
- (c) Tree Protection Zone distances are to be measured from the outside edge of the tree base towards the drip line and may be limited by an existing paved surface, provided the existing paved surface remains intact throughout the construction work.

E6.2.5 Tree Protection Barriers

- (a) Trees within tree protection zones shall be protected by means of a “tree protection barrier” meeting the following Specifications:
 - (i) the required barrier is a 1.2 m high orange plastic web snow fencing on 50 mm x 100 mm frame or as directed by the City of Winnipeg Urban Forestry Branch in accordance with the City of Winnipeg Protection of Existing Tree Specifications. The barrier can be lowered around branches lower than 1.2 m. The barrier location can be adjusted to align with curbs and edges at clear path of travel zones.
 - (ii) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 mm x 100 mm x 2400 mm wood planks, or suitably protected as approved by the Contract Administrator.
 - (iii) Tree protection barriers are to be erected prior to the commencement of any construction or grading activities on the site and are to remain in place throughout the entire duration of the project. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place;
 - (iv) All supports and bracing used to safely secure the barrier should be located outside the TPZ. All supports and bracing should minimize damage to roots. No grade change, storage of materials or equipment is permitted within this area. The tree protection barrier must not be removed without the written authorization of the City of Winnipeg;
 - (v) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation; and
 - (vi) Operation of equipment within the drip line of the trees shall be kept to a minimum required to perform the work required. Equipment shall not be parked, repaired, refueled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The drip line of a tree shall be considered to be the ground surface directly beneath the tips of its outmost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

E6.2.6 Utility Construction, Engineering, and Capital Construction Projects

- (a) It is recognized that there are cases where trees are growing overtop existing utilities or beside capital infrastructure. While the guidelines in this section still apply, in these cases some modification to Table 9 - 1 in addition to root pruning may be permitted provided non- open trench methods of construction are employed (as defined in CW 2110 and CW 2130).
- (b) Root Pruning will be required to be done under the direction of, and along with, written sign-off by the Project's Qualified Tree Consultant (Refer to E6.2.7). The objective is to avoid severance of anchor roots, which provide upright support for trees and minimize damage to the tree.
- (c) Above ground clearance for overhanging branches in the work zone must be anticipated. The utility or its consultant is required to have a Forestry approved tree service raise the crown of all branches to provide adequate clearance for construction equipment.

E6.2.7 Qualified Tree Consultants

- (a) An arborist certified by the International Society of Arboriculture (ISA) who has a diploma (minimum) in arboriculture or with a Manitoba Arborist license.
- (b) A landscape architect who is a member in good standing of the Manitoba Association of Landscape Architects.

E6.3 Materials

E6.3.1 General

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

E6.4 Equipment

E6.4.1 General

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

E6.5 Quality Control and Assurance

E6.5.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E6.5.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E6.6 Measurement and Payment

- E6.6.1 Protection of trees will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E7. CONTRACTOR PARKING

- E7.1 Parking of private work force vehicles outside the Contractor's laydown area(s) without prior written authorization from the Contract Administrator is prohibited. Requests to the Contract Administrator for private work force vehicle parking must include the reason for the request, the time frame of the request, description of any parking alternatives that were considered by the Contractor but not deemed feasible and a description of the specific location intended to accommodate the parking.

E8. TRAFFIC CONTROL

E8.1 Description

- E8.1.1 This Specification shall cover all operations relating to traffic control.
- E8.1.2 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 Work as hereinafter specified.

E8.2 References

- E8.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
- (a) CW 1130
 - (b) CW 3410

E8.3 Scope of Work

- E8.3.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130, the Work under this Specification shall include:
- (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 CW 3410.
 - (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 supplying, placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC, the Contract Drawings, Staging Plans, and Traffic Management Plans or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the supply, placement and maintenance of temporary traffic control devices by their own forces or subcontractor.

- (c) In addition, the Contractor shall be responsible for supplying, removing, placing, and maintaining all regulatory signing including but not limited to:
 - (i) Parking restrictions,
 - (ii) Stopping restrictions,
 - (iii) Turn restrictions,
 - (iv) Diamond lane removal,
 - (v) Full or directional closures on a Regional Street,
 - (vi) Traffic routed across a median,
 - (vii) 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.
- (d) The Contractor shall remove and stockpile any regulatory signage not required during construction such as but not limited to parking restrictions, turn restrictions and loading restrictions.

E8.3.2 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

E8.3.3 Further to E7.3.1(c) and E7.3.1(d) the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the contract work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.

E8.3.4 Any changes to the approved traffic management plan must be submitted to the Contract Administrator a minimum of five (5) Business Days prior to the required change for approval.

E8.3.5 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this specification, Traffic Services may be engaged to perform the Traffic Control and the Contractor shall bear the costs associated by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E8.4 Materials

E8.4.1 General

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

E8.5 Equipment

E8.5.1 General

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

E8.6 Measurement and Payment

E8.6.1 Traffic Control will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E9. TRAFFIC MANAGEMENT

E9.1 Description

E9.1.1 This Specification shall cover all operations relating to Traffic Management.

E9.1.2 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 Work as hereinafter specified.

E9.2 References

E9.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) CW 1130

E9.3 Scope of Work

E9.3.1 Further to clauses 3.7 of CW 1130, the Work under this Specification shall include:

- (a) Where not shown on the Drawings, single lane closures on intersecting and/or adjoining Regional Streets shall only be permitted during non-peak periods when required for construction activities when approved by the Traffic Management Branch. Storage/parking of materials, equipment or vehicles is not permitted on Regional Streets at any time unless approved by the Contract Administrator, in consultation with the Traffic Management Branch.
- (b) An approved traffic staging/ signage plan is included in the Drawings. Any changes to this plan with respect to lane closures must be approved by the Contract Administrator.
- (c) The southbound to westbound ramp and the southbound to eastbound loop shall not be closed to traffic concurrently.
- (d) The northbound to eastbound ramp and the northbound to westbound loop shall not be closed to traffic concurrently.
- (e) The Contractor shall provide a watchperson as described below.
- (f) Flag persons may be necessary to maintain the flow of traffic during certain work operations.
- (g) 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 Pembina Highway at all times. One pedestrian crossing in the east-west direction and one pedestrian crossing in the north-south direction must be maintained at each intersection at all times.
- (i) Ambulance/emergency vehicle access must be maintained at all times.
- (j) Winnipeg Transit access to be maintained, including bus stops. Should the Contractor be unable to maintain bus stops or side street bus routes, it shall be reviewed with the Contract Administrator at least forty-eight (48) hours to see if modifications can be made.

E9.4 Materials

E9.4.1 General

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

E9.5 Equipment

E9.5.1 General

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

E9.6 Construction Methods

E9.6.1 General

- (a) The Contractor shall advise the Contract Administrator fourteen (14) Business Days in advance of any new or change in lane closure.
- (b) Erect and maintain all applicable traffic control devices (including, but not limited to, warning signs, barrels, tall cones and chevrons) as specified by MTTC, the Traffic Management Branch, the Contract Administrator.
- (c) The Contractor shall supply a watchperson who shall be available after traffic control devices have been positioned. When equipment is working the Contractor shall delegate one person to assume the duties of the watchperson. When equipment is shut down the watchperson shall periodically patrol the work to ensure that traffic control devices are properly positioned, in good condition and that the roadway is in a safe condition for road users.
- (d) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the MTTC and shall, at all times, ensure that maximum protection is afforded to the road-user and that his/her operations in no way interfere with the safe operation of traffic, cyclists or pedestrians.
- (e) Improper signing will be sufficient reason for the Contract Administrator to order the Works to cease on Site.
- (f) During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present a hazard to motorists, cyclists or pedestrians.

E9.7 Measurement and Payment

- E9.7.1 Traffic Management will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E10. PEDESTRIAN SAFETY

E10.1 Description

- E10.1.1 This Specification shall cover all operations relating to pedestrian safety within and surrounding the project limits, as determined by the Contract Administrator.
- E10.1.2 During the project, a temporary snow fence shall be installed at locations as deemed required by the Contract Administrator to ensure pedestrian safety. The Contractor shall be responsible for maintaining the snow fence in a proper working condition.

E10.2 Materials

E10.2.1 General

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

E10.3 Equipment

E10.3.1 General

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

E10.4 Measurement and Payment

- E10.4.1 Pedestrian Safety will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E11. WATER OBTAINED FROM THE CITY

E11.1 Description

- E11.1.1 This Specification shall cover all operations relating to the Water obtained from the City for use on the project.

- E11.1.2 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E11.2 Equipment

E11.2.1 General

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

E11.3 Measurement and Payment

- E11.3.1 Water Obtained from the City will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E12. SURFACE RESTORATIONS

E12.1 Description

- E12.1.1 This Specification shall cover all operations relating to surface restorations. 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.

- E12.1.2 The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed.

- E12.1.3 Where the Contractor chooses to perform any part of the Work that impacts the existing surface conditions for pedestrian, bicycle and vehicle passage, without promptly completing the final surface works required in Contract, the Contractor shall construct temporary surface restorations meeting the requirements of 3.3 of CW 1130 and to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary surface restorations in a safe condition until the final surface works are completed by the Contractor according to Contract.

E12.2 Materials

E12.2.1 General

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

E12.3 Equipment

E12.3.1 General

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

E12.4 Quality Control and Assurance

E12.4.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E12.4.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E12.5 Measurement and Payment

- E12.5.1 Temporary repairs / surface restorations and their maintenance will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E13. VERIFICATION OF WEIGHTS

E13.1 Description

- E13.1.1 This Specification shall cover all operations relating to the verification of weights for all material which is paid for on a weight basis.

- E13.1.2 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

- (a) All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.
- (b) The tare weight and net weight may either be handwritten or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

- (i) checking Contractor's scales for Consumer & Corporate Affairs certification seals;
 - (ii) observing weighing procedures;
 - (iii) random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale;
 - (iv) checking tare weights shown on delivery tickets against a current tare.
- (c) No charge shall be made to the City for any delays or loss of production caused by such inspection and verification.

E13.1.3 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.

E13.1.4 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

- (a) upon which scale the truck or truck/trailer(s) combination was weighed;
- (b) the mechanically printed tare weight;
- (c) the license number(s) of the truck and trailer(s);
- (d) the time and date of weighing.

E13.1.5 Further to clause 3.16.3 of CW 1130 no charge shall be made to the City for any delays or loss of production caused by inspection and verification.

E13.2 Quality Control and Assurance

E13.2.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E13.2.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E13.3 Measurement and Payment

- E13.3.1 Verification of Weights will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E14. HYDRO-EXCAVATION

E14.1 Description

- E14.1.1 This Specification shall cover the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the recovery of excavated material by vacuum type means or equivalent method as approved by the Contract Administrator.

E14.2 Materials

E14.2.1 General

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

E14.3 Equipment

E14.3.1 General

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

E14.4 Construction Methods

E14.4.1 Hydro-Removal of Earthen Material

- (a) The Contractor shall only be compensated for hydro-excavation undertaken with prior permission of the Contract Administrator. The Contractor shall only be compensated for hydro-excavation required to locate utilities whose location is uncertain. Hydro-excavation required to expose utilities shown on the Drawings by Safety Watches shall not be compensated and shall be considered incidental to the Work.
- (b) 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. Expose the buried utility by using a sweeping motion only, perpendicular to the locate markings, until the line is sighted. After sighting, the line shall not be contacted by spray or vacuum to avoid damage.
- (c) Maximum settings when excavating within 1 m of marked utilities will be 38°C (100°F) temperature and 10,342 kPa (1500 psi) pressure.

E14.4.2 Recovery of Excavated Material

- (a) The recovery of excavated material shall be done using a vacuum type method, or other type method as approved by the Contract Administrator.
- (b) The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filling with excavated material.
- (c) The use of mechanical sweepers will not be allowed.
- (d) Dispose of material in accordance with Section 3.4 or CW 1130-R1.

E14.4.3 Backfill of Hydro Excavated Material

- (a) The Contractor shall be responsible for the backfill of the hydro excavated hole upon acceptance of the Work described herein by the Contract Administrator.

E14.5 Quality Control and Assurance

E14.5.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E14.5.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E14.6 Measurement and Payment

E14.6.1 Hydro-Excavation

- (a) Hydro-Excavation of earthen material and its recovery and disposal as well as backfilling the hole 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 completed in accordance with this Specification, accepted and measured by the Contract Administrator.
- (b) The hours to be paid for "Hydro-Excavation" shall be measured as the time spent on-site by the required equipment and shall be approved daily by the Contract Administrator.

E15. TEMPORARY PRECAST CONCRETE TRAFFIC BARRIERS

E15.1 Description

- E15.1.1** This Specification shall cover all operations relating to the transportation, installation, maintenance, and return of precast concrete traffic barriers as shown on the Construction Staging Drawings.
- E15.1.2** The Work to be done by Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E15.2 Scope of Work

- E15.2.1** The work under this Specification shall include:

- (a) Transporting (including loading) temporary precast concrete traffic barriers to project site and installation on site;
- (b) Relocating temporary precast concrete barriers on Site between construction phasing as shown on the Drawings;
- (c) Removing from site and transporting (including unloading) temporary precast concrete traffic barriers;
- (d) Maintaining the precast concrete traffic barriers in position on site throughout the project as part of his/her overall work and traffic management plans (no additional payment for maintenance).

E15.3 Materials

E15.3.1 General

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

E15.3.2 Precast Concrete Barrier

- (a) The precast concrete barriers will be supplied by the City of Winnipeg Public Works Department and consist of one (1) type of barriers as follows:
 - (i) Type 1 – Standard Barrier;
- (b) The Contractor shall arrange to pick-up, load, deliver, and upload the precast concrete barriers to the Site from the City of Winnipeg Bridge Yard at 960 Thomas Avenue and pick-up, load, deliver, and unload the precast concrete barriers to the City of Winnipeg Bridge Yard at 960 Thomas Avenue from Site by contacting Mike Terleski at 204-794-8510.

E15.4 Equipment

E15.4.1 General

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

E15.5 Construction Methods

E15.5.1 Transporting Precast Concrete Barriers

- (a) The Contractor shall be responsible for the pickup and delivery of the pre-cast concrete barriers and all applicable components to the Site. The Contractor shall supply equipment capable of lifting and loading the barriers at the City yard and safely transporting to and unloading the barriers at the site. Any damage occurring to the barriers during loading, transporting and unloading shall be repaired at the Contractor's expense.
- (b) Prior to leaving the yard the Contractor's personnel shall inspect the barriers in conjunction with City personnel and note any obvious damage. The Contractor shall provide the Contract Administrator with a written description of any damage noted prior to transportation of the barriers.
- (c) The City will supply the contractor with all precast concrete barriers required for the project.
- (d) A minimum of twenty-four (24) hours' notice is required prior to pick up of the barriers. Once the barriers have reached the Site they shall be carefully unloaded, placed and assembled at the locations shown on the Drawings.

E15.5.2 Installation of Precast Concrete Barriers

- (a) Precast concrete barriers shall be installed in proper vertical and horizontal alignment and properly connected to the satisfaction of the Contract Administration.
- (b) Schedules for installing or removing the precast concrete barriers shall be approved by the Contract Administrator prior to any Work beginning on those items.
- (c) Once the concrete section of each barrier has been placed, the Contractor shall anchor the barrier in a manner approved by Contract Administrator. Should there be any missing nuts bolts or washers, the Contractor shall supply new galvanized nuts, bolts and/or washers.

E15.5.3 Maintain and adjust temporary concrete barriers as required through the duration of the Project, the maintenance and adjustment to temporary precast concrete barriers shall be deemed incidental to the Work.

E15.5.4 Relocation of Precast Concrete Barriers

- (a) The Contractor shall relocate precast concrete barriers between construction phasing as shown on the Drawings.

E15.5.5 Removal and Transportation of Precast Concrete Barriers

- (a) The Contractor shall be responsible for the removal and delivery of the precast concrete barriers and all applicable components from Site. The Contractor shall return all barriers to the City Bridge Yard. The Contractor shall supply all necessary equipment to unload and return the barriers to their designated locations within the City Bridge Yard. Any damage occurring to the barriers during loading, transporting, and unloading shall be repaired at the Contractor's expense. Any missing items or components originally supplied by the City shall be replaced at the Contractor's expense. Upon return of the barriers, the Contractor's personnel and City's personnel shall inspect and inventory the barriers and all applicable components.

E15.6 Quality Control and Assurance

E15.6.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E15.6.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E15.7 Measurement and Payment

E15.7.1 Type 1 – Standard Barrier

- (a) Transporting, installing, relocating and removal of precast concrete barriers shall be measured on a unit basis and paid for at the Contract Unit Price per unit for “Type 1 - Standard Barrier”, measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E15.7.2 Payment for the precast concrete traffic barriers will be 50% of the unit price for each unit being placed to the satisfaction of the Contract Administrator and 50% of the unit price for each unit returned to the yard as accepted by the Contract Administrator.

STRUCTURAL WORKS

E16. STRUCTURAL REMOVALS

E16.1 Description

E16.1.1 This Specification shall cover all operations relating to:

- (a) The removal and disposal of miscellaneous existing bridge components and concrete, as specified herein and as shown on the Drawings.
- (b) Structural Removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, dismantlement, and disposal of applicable materials.

E16.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E16.2 References

E16.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) D21 Environmental Protection Plan;
- (b) D22 Environmental Protection Plan – Migratory Birds;
- (c) E8 Traffic Control;
- (d) E9 Traffic Management;
- (e) E10 Pedestrian Safety;
- (f) City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers;
- (g) ICRI Guideline No. 03732.

E16.2.2 Details of the Existing Structure

- (a) Applicable details and structure dimensions of the existing structures are shown on the Drawings for information only in establishing the methods and limits of Work.
- (b) The information shown has been obtained from existing Drawings, measurements, and observations at the Site. The accuracy of this information is not guaranteed, and the Contractor must verify all information before commencing Work.

E16.3 Scope of Work

E16.3.1 The Work under this Specification shall specifically include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

- (a) Concrete Removals as follows:

- (i) Partial removal and disposal of the existing bridge deck with thin epoxy overlay;
 - (ii) Complete removal and disposal of all traffic barriers, median barrier, and handrail curbs;
 - (iii) Partial removal and disposal of concrete approach slabs; and
 - (iv) Concrete removal shall include removal of reinforcing steel, conduits, cable and temporary asphalt as shown on the Drawings.
- (b) Steel Removals as follows:
- (i) Complete removal and disposal of existing bridge expansion joints assemblies and cover plates;
 - (ii) Complete removal and disposal of existing bridge deck drains; and
 - (iii) Supply and installation of stainless-steel plates and fasteners.
- (c) Salvage Items as follows:
- (i) Removal and salvaging of aluminum pedestrian handrail.
- (d) Completing all structural removals with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way onto the sidewalk or roadway lanes which shall remain open to traffic.
- (e) Providing saw cuts as shown on the Drawings and where otherwise necessary to limit the extent of demolition;
- (f) Repairing any over demolition and damage to reinforcing steel or other structural components to the satisfaction of the Contract Administrator;
- (g) Complying with any and all environmental requirements identified in the Specifications or otherwise applicable to the proposed Works;
- (h) All materials not identified for salvage shall be disposed of at an approved disposal facility by the Contractor. Any disposal fees shall be considered incidental to this Work.

E16.4 Submittals

E16.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any removal Works on Site, a detailed removal plan and schedule clearly illustrating the method and sequence by which the Contractor proposes to perform the structural removals including a description of the measures that will be implemented to meet the applicable environmental requirements identified in "PART D - Supplemental Conditions". The removal procedure shall include Detailed Design notes and Shop Drawings that are sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba necessary for the following proposed items:

- (a) Work platforms (suspended from the existing superstructure, supported from the existing ground, or otherwise);
- (b) Type, capacity, and equipment specifications of removal equipment;
- (c) Sequence of removal operations;
- (d) Fencing plan to prevent public access until all railings are reconstructed.
- (e) Design of demolition catch platforms (if different than work platforms) to contain all removal/demolition debris from entering onto the roadway below;
- (f) Description of the measures that will be implemented to meet the requirements identified in "PART D - Supplemental Conditions".

E16.4.2 The Contractor shall prepare and submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any hydro-demolition Work on Site, a hydro-demolition plan detailing the Contractor's proposed hydro-demolition runoff control and disposal methods and procedures.

- (a) Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers, prior to entering the City's land drainage sewer system.
- (b) At no time can runoff of wastewater be permitted to enter the watercourse or the City's land drainage system unfiltered.

E16.5 Materials

E16.5.1 General

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

E16.5.2 Demolition Catch Platforms and Work Platforms

- (a) Shall be in accordance with E20 Temporary Protective Systems.

E16.6 Equipment

E16.6.1 General

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

E16.6.2 Hydro-Demolition Equipment

- (a) The hydro-demolition equipment shall be a self-propelled tracked machine that utilizes a high pressure water jet stream capable of removing concrete to the limits shown on the Drawings or as directed by the Contract Administrator and be capable of removing rust and concrete particles from reinforcing steel. The use of a hand-held lance shall be acceptable for horizontal and vertical surfaces. Pneumatic hammers (15 kg, 35 pound class maximum) may be used in areas that are inaccessible or inconvenient to the self-propelled machine such as, but not limited to, areas not to exceed 300 mm away from the bridge edges, subject to approval of the Contract Administrator.
- (b) The above specified self-propelled tracked machine shall meet the minimum/maximum dimensions shown on the Drawings with respect to track spacing, length of machine, etc. and shall not exceed 2500 kg GVW.
- (c) The use of any hydro-demolition equipment not conforming to the above requirements will not be permitted unless a formal request is provided by the Contractor for the Contract Administrator's review accompanied by a sealed, signed, and dated letter prepared by a Professional Engineer licensed to practice in the Province of Manitoba certifying that the proposed hydro-demolition equipment will not detrimentally affect the structural integrity of the structure.

E16.6.3 Demolition Barriers

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

E16.6.4 Sequence Of Structural Removals

- (a) Construction sequencing of all structural removals shall take place as shown on the Drawings.

E16.7 Construction Methods

E16.7.1 General

- (a) Structural removals shall be deemed to include all the items of work as listed under Clause E16.3 of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.
- (b) The Contractor shall be fully responsible for ensuring the Public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.
- (c) The Contractor shall provide flagmen, guards, barricades, railings, fencing and necessary warning lights, and whenever/wherever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or other construction, to secure the safety of workmen and the Public. The safety precautions shall comply with all Provincial Statutes applicable to the Work. The Contractor shall provide all other protective measures as may be required by any Law in force in Manitoba and the Canada Labour Code.
- (d) Traffic and pedestrian control shall conform to the requirements of E8 "Traffic Control", E9 "Traffic Management" and E10 "Pedestrian Safety".
- (e) Under no circumstances shall the Contractor close any portion of existing roadways or walkways to traffic without prior written approval of the Contract Administrator. If any existing roadway is to be closed to traffic in no case shall the Contractor commence any construction operations until such time that all the signs, barricades, and flashers have been erected to the satisfaction of the Contract Administrator.
- (f) The Contractor shall generally prevent any unspecified and undesirable movement or settlement of the existing structure, damage to any existing structures to remain, and damage to any services, paving, trees, landscaping and adjacent grades not specified for removal/disturbance. The Contractor shall design and provide any bracing, shoring or underpinning necessary to complete the work as required and shall have any designs for this Work sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba. If the safety of the structure and/or existing services appears to be endangered during structural removal operations or if the Work is detrimentally impacting the environment, the Contractor shall cease operations and notify the Contract Administrator immediately. Additionally, if the Work is proceeding in a fashion unsatisfactory to the Contract Administrator for any reason, the Contractor will be notified and shall cease operations immediately.
- (g) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural components or to any new construction. In the event that any component is damaged, the Contractor shall repair such component at his own expense to the satisfaction of the Contract Administrator.
- (h) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.
- (i) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on Site will be allowed without written approval of the Contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the Site.
- (j) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any neighbouring roadways or sidewalks during removal operations.
- (k) The Contractor shall visit the Site to become familiar with the existing conditions and scope of work prior to bid submission. No allowance for extras will be made for any structural removals, not foreseen by the Contractor, required to complete the scope of Work.
- (l) The Contractor shall provide all necessary access to facilitate concrete removals and subsequent inspection of all the Works by the Contract Administrator.
- (m) The Contractor shall be fully responsible for ensuring the public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.

- (n) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures. Limits of demolition shall be straight and saw-cut to provide a clean edge at the extent of demolition.
- (o) Following the initial removal of concrete, the Contract Administrator will conduct a delamination survey to determine if any additional concrete removal will be required. These areas will be clearly marked out by the Contract Administrator for the Contractor's completion of delamination repairs.
- (p) The Contractor shall only use methods of concrete removal that will not damage existing reinforcing steel to remain or new structures.
- (q) Construction methods specific to the removal of each bridge component are provided in the following Clauses.

E16.7.2 Concrete Removals

- (a) No removal works including the full-depth superstructure isolation will be permitted to occur prior to the implementation of the necessary traffic control requirements in accordance with E8 Traffic Control.
- (b) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures.
- (c) For partial removal of concrete, edges shall be sawcut to straight and clean lines.
- (d) Removals may be accomplished by full-depth saw cuts where possible provided any existing reinforcement required to be maintained is not damaged in the process. Subsequent removal around existing reinforcement specified to be maintained will be required with the use of hand removal, hydro-demolition, or other means acceptable to the Contract Administrator.
- (e) The final surface preparation of the concrete to remain (concrete substrate) shall be conducted by hydro-demolition, or other means acceptable to the Contract Administrator. The resulting surface shall achieve the required elevations while being roughened to the minimum following requirements:
 - (i) For horizontal surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP6 (Medium Scarification).
 - (ii) For vertical surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP4 (Light Scarification).

E16.7.3 Steel Removals

- (a) The Contractor shall only use methods of steel removal that will not damage the existing structure to remain or new structures. The supply and installation of stainless-steel plates and fasteners to cover the existing deck drain downspout soffit openings will be considered incidental to the Work.

E16.7.4 Salvage Items

- (a) The Contractor shall be responsible for removing all salvage items and stockpile at a location within the City of Winnipeg indicated by the Contract Administrator. The Contractor shall only use methods of removal that will not damage the salvaged items.

E16.7.5 Hydrodemolition

- (a) Removal by hydro-demolition shall be completed in accordance with this Specification.
- (b) The final surface preparation of the deck concrete to remain (concrete substrate) shall be conducted by hydro-demolition, or other means acceptable to the Contract Administrator. The resulting surface shall be roughened to the minimum following requirements:
 - (i) For horizontal surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP8 (Scabbled)
 - (ii) For vertical surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP6 (Medium Scarification).

- (c) During the removal of concrete, the Contractor shall make sure not to damage the existing reinforcement that is noted to remain, or other components as shown in the Drawings.
- (d) Prior to the commencement of any removal operation by hydro-demolition, the hydro-demolition equipment shall be calibrated on an area of sound concrete approximately 600 mm x 1500 mm as directed by the Contract Administrator. The cost of the calibration procedure is incidental to the Work. The Contractor shall provide the Contract Administrator with the following settings:
 - (i) Water pressure;
 - (ii) Machine staging control (step);
 - (iii) Nozzle size;
 - (iv) Nozzle speed.
- (e) During the calibration, any or all of the above settings may be adjusted in order to achieve removal in accordance with the requirements of the Drawings. When the designated depth of removal is attained, the settings shall be recorded and maintained throughout the removal operation unless otherwise directed by the Contract Administrator. The depth of removal shall be verified periodically and, if necessary, the equipment recalibrated to ensure the depth of removal as indicated on the Drawings is achieved.
- (f) Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers, prior to entering the City's land drainage sewer system. At no time can runoff of wastewater be permitted to enter the watercourse, or enter the City's land drainage system unfiltered. The Contractor shall complete daily pH tests in the presence of the Contract Administrator on wastewater runoff to ensure that all discharging of wastewater is in compliance with the City's By-laws. All test reports shall be submitted to the Contract Administrator, and must be within acceptable limits prior to any wastewater entering the City's land drainage sewer system.
- (g) The Contractor shall take all necessary precautions to ensure that no sound concrete located below the required depth of removal is damaged or removed. Any damage caused to sound concrete or reinforcing steel beyond the required limit of removal or excessive removal of concrete beyond the required depth of removal by the Contractor during any demolition procedure will be repaired by the Contractor at the Contractor's own expense to the satisfaction of the Contract Administrator.
- (h) Where applicable, any "shadowing" of the reinforcing steel by concrete not removed by the process of hydro-demolition shall be removed by the Contractor through other approved means.
- (i) After the hydro-demolition is completed, the remaining concrete surface shall be inspected through methods of sounding by the Contract Administrator to ensure that all deteriorated concrete has been removed. Should deteriorated concrete be found, the Contractor shall remove the areas of deteriorated concrete by additional passes of the hydro-demolition equipment or other equipment approved by the Contract Administrator. Payment for removal of these areas shall be considered incidental to the Work.
- (j) Upon completion of the hydro-demolition of each section of the Work, the Contractor shall remove all cuttings, slurry containing the products of hydro-demolition, and all other debris from the resulting concrete surface so as to produce a thoroughly clean surface. Cleaning of each section shall be done before debris and water are allowed to dry on the deck surface and prior to the placement of reinforcing steel.
- (k) All exposed reinforcing steel which is left unsupported by the hydro-demolition process shall be adequately supported and protected from all equipment. All reinforcing steel damaged or dislodged by these operations, as deemed by the Contract Administrator, shall be replaced with new reinforcing of the same size at the expense of the Contractor.

E16.7.6 Waste Handling and Disposal of Removed Materials

- (a) Dispose of all surplus and unsuitable material off-site, in accordance with D21 Environmental Protection Plan.
- (b) Wherever practical, the Contractor shall recycle disposed materials.
- (c) The Contractor shall submit a list of locations of disposal / recycling for all removed materials to the Contract Administrator.
- (d) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on-site will be allowed without written approval from the Contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

E16.7.7 Construction Load Limitations for Equipment

- (a) Following removal of the top mat of reinforcing steel in the existing bridge deck sidewalks, and until the new sidewalk overlay concrete has reached a three day age and 20 MPa strength, the loads applied to the exterior 750 mm of the bridge deck will be limited to dead loads plus a live load of two kilopascals (2 kPa).

E16.7.8 Bridge Deck Survey

- (a) The Contractor shall complete a survey of the existing bridge deck on a 1 m x 1 m grid prior to commencing any deck removals. The elevations shall be submitted to the Contract Administrator for comparison with the final deck surface elevations to determine the final extent of removals.
- (b) The Contractor shall complete a survey of the final bridge deck on the same 1 m x 1 m grid as used in E16.7.8(a) after completion of all removals and final preparation of the deck surface prior to placement of new concrete. The elevations shall be submitted to the Contract Administrator for review and comparison with the pre-existing survey to determine the final extent of removals.
- (c) The Contract Administrator shall use the results of the final survey to provide the final screed elevations for the new deck slab concrete. The final screed elevations shall be provided within five (5) Business Days from receipt of the survey elevations.

E16.8 Quality Control and Assurance

E16.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E16.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator

- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E16.9 Measurement and Payment

E16.9.1 Structural Removals will not be measured. Structural removals 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 supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(a) Items of Work:

Structural Removals:

- (i) Concrete Removals;
- (ii) Steel Removals;
- (iii) Salvage Items.

E17. STRUCTURAL CONCRETE

E17.1 Description

E17.1.1 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.

E17.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E17.2 References

E17.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) American Concrete Publication SP4 – Formwork for Concrete;
- (b) ASTM A1035 – Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement;
- (c) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes;
- (d) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;
- (e) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;
- (f) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;
- (g) ASTM C881- Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;
- (h) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;
- (i) ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete;
- (j) ASTM C1609 – Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third Point Loading);
- (k) ASTM C1876 – Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete;

- (l) CSA A23.1 – Concrete Materials and Methods of Concrete Construction;
- (m) CSA-A3001 – Cementitious Materials for Use in Concrete; and
- (n) CSA O121 – Douglas Fir Plywood.

E17.3 Scope of Work

E17.3.1 The Work under this Specification shall include:

- (a) Supplying and placing structural concrete for bridge deck overlay and approach slab overlay;
- (b) Supplying and placing structural concrete for sidewalk overlay with monolith curb;
- (c) Supplying and placing structural concrete for median slabs and median curbs;
- (d) Supplying and placing structural concrete for traffic barriers;
- (e) Supplying and placing structural concrete for wingwall curbs; and
- (f) Supplying and placing structural concrete for abutment shear blocks.

E17.4 Submittals

E17.4.1 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.

E17.4.2 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 outlined 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 and may be used as information related to supplementary testing and investigation of suspected defective concrete. The City of Winnipeg will advise the Supplier if the information needs to be released to third parties. 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;
 - (ix) Certification that all concrete constituents are compatible; and

- (x) Certification that the concrete mix(es) will meet the specified concrete performance requirements.
- (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.
 - (i) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance to CSA A23.1-04 Clause 4.3.2.3.2.
 - (ii) 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.

E17.4.3 Concrete Mix Design Test Data

- (a) Concrete
 - (i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.
 - (ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-19, Section 16, Fibre Reinforced Structures, Clause 16.6.
 - (iii) Testing for post-cracking residual strength index (Ri) of FRC shall be tested as follows:
 - ◆ One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure in accordance to ASTM C1609-10. The average of the peak loads is the cracking load of the concrete (Pcr).
 - ◆ A second set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure in accordance with ASTM C1399-04. The average of the peak loads during reloading is the post cracking load of the concrete (Ppcr).
 - ◆ The Ri is equal to the ratio of Ppcr over Pcr. The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Tests conducted in accordance to ASTM C1399-04 will be considered invalid by the Contract Administrator if the initial crack in the specimen has occurred after 0.5 mm deflection. Provide all load deflection curves with test submissions (initial and reloading curves).
 - (iv) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into the form. At the discretion of the Contract Administrator, if the Contractor can demonstrate a relationship between the plastic concrete properties at the point of discharge into the formwork and the end of the chute of the delivery truck, the Contract Administrator may accept test results at the end of the chute with the

appropriate adjustments to the wet concrete performance requirements as being representative of what is in the formwork.

(b) Aggregates

- (i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.
 - (ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.
 - (iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.
 - (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.

E17.4.4 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 twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

E17.4.5 Temporary False Work, Formwork and Shoring Works

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and shop drawings for any temporary Works, including falsework, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.
- (b) Design Requirements

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. Falsework 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.

- (m) For timber formwork and falsework, 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.

E17.4.6 Screed for Overlay Concrete

- (a) Plans for anchoring support rails shall be submitted to the Contract Administrator for review and acceptance at least fourteen (14) 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.

E17.4.7 Concrete Overlay Pour Sequence and Schedule

- (a) The Contractor shall pour the deck, approach slab, and sidewalk overlay concrete in accordance with the pour sequence as outlined in the Drawings. Should the Contractor opt to submit an alternate construction pour sequence for the deck slab concrete, the Contractor shall submit the proposed alternate construction pour sequence to the Construction Administrator for review, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement.
- (b) 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.
- (c) 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.

E17.5 Materials

E17.5.1 General

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

E17.5.2 Testing and Approval

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the testing laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least five (5) Business Days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.

E17.5.3 Adhesive Agent

- (a) Adhesive agent for bonding steel reinforcing or dowels to concrete shall conform to the requirements of ASTM C881, Type V, Grade 3, Class A, B and C, except linear

shrinkage. An acceptable product would be Hilti Hit-RE 500 V3, or equivalent as approved by the Contract Administrator.

E17.5.4 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanship like manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-04.

E17.5.5 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 E23-1.

E17-1 REQUIREMENTS FOR HARDENED CONCRETE						
Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Barriers, Median Curbs, Median Slabs, and Abutment Shear Blocks	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15
Bridge Deck Overlays, Approach Slab Overlays, Sidewalk Overlays, and Bridge Sidewalk Curbs	50 @ 56 Days	C-1	1	20 mm	Synthetic Fibres	0.15

E17.5.6 Working Base Concrete

- (a) Working base concrete shall be placed in the locations as shown on the Drawings.
- (b) Working base shall be concrete meeting the requirements of CAN/CSA A23.1 latest edition, for S-1 class of exposure, except as follows:
- (i) 20 MPa at 28 days.

E17.5.7 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 A23.2-27A-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 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 CSA A23.1-04, 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 CSA A23.1-04, Table 12.
- (c) Coarse Aggregate – Standard
 - (i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-04, 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) Coarse aggregate when tested for abrasion in accordance with 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 CSA A23.1-04, Table 12, for concrete exposed to freezing and thawing.

E17.5.8 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.

E17.5.9 Cementitious Materials

- (a) Cementitious materials shall conform to the requirements of 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.

E17.5.10 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 CSA A23.1-04 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.

E17.5.11 Synthetic Fibres

- (a) The synthetic fibres shall consist of 100% virgin polypropylene or 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 (Ri) and fibre dispersion in accordance to the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6 except the post-cracking residual strength index (Ri) shall be determined in accordance with ASTM C1609.

E17.5.12 Formwork

- (a) Formwork materials shall conform to CSA Standard A23.1-04, 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 CSA Standard O121-M1978. 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 non-rusting material or stainless 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 falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E17.5.13 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 B6.

E17.5.14 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B6. 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 deck slab 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.

E17.5.15 Architectural Formwork Liner

- (a) The Contractor shall supply and install the architectural concrete finish formwork liner for use at the location backside of the bridge traffic barriers and roadway traffic barriers as shown on the drawings in accordance with the Manufacturer's recommended procedures. Approved products are #154 (½" sine wave) by Scott Systems.

E17.5.16 Curing Compound

- (a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.
- (b) Curing compound for approach slabs and slope paving shall be resin-based and white- pigmented.
- (c) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B7.

E17.5.17 Curing Blankets

- (a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour.
- (b) 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 B6.

E17.5.18 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 B6. 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 new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
 - ◆ 1 part water;
 - ◆ 1 part latex bonding agent; and,
 - ◆ 1½ 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.

E17.5.19 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, Concessive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B7.

E17.5.20 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.

E17.5.21 Cementitious Grout

- (a) Cementitious grout shall be nonshrink and nonmetallic. 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 B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E17.5.22 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.

E17.5.23 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 B6.

E17.5.24 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 Standard D1751-99 or equal as accepted by the Contract Administrator, in accordance with B7.

E17.5.25 EMSEAL Precompressed Foam Joint Filler

- (a) Expansion joint seal shall be EMSEAL BEJS or equivalent as approved by the Contract Administrator to ASTM C711 and ASTM G155-00A.
 - (i) Sealant system shall be comprised of three components:
 - ◆ Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water- based emulsion, factory coated with highway-grade, fuel resistant silicone;
 - ◆ Field-applied epoxy adhesive primer; and,
 - ◆ Field-injected silicone sealant bands.
 - (ii) Impregnation agent to have proven non-migratory characteristics. Silicone coating to 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. Depth of seal as recommended by manufacturer. BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field- applied injection band of silicone is installed between the substrates and the foam- and- silicone-bellows, the system will be ½" (12 mm) down from the substrate surface.
 - (iii) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plane and direction shall be executed using factory fabricated "Universal 90" transition assemblies. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.

- (iv) All substitute candidates to be certified in writing to be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be certified in writing to be:
 - ◆ Capable of withstanding 65°C for three (3) hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of normal material size) without evidence of any bleeding of impregnation medium from the material; and,
 - ◆ That the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within twenty-four (24) hours at room temperature 20°C.

E17.5.26 Ethafoam Joint Filler

- (a) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application and shall be the type accepted by the Contract Administrator in accordance with B7.

E17.5.27 Low Density Styrofoam

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

E17.5.28 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%.

E17.5.29 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.
- (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.

E17.5.30 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.
- (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.

E17.5.31 Anchor Units for Aluminum Pedestrian Handrail/Bicycle Rail and Anti-Debris Screen

- (a) Anchor units for the aluminum pedestrian handrail/bicycle rail shall be stainless steel Acrow-Richmond Type DGRS-1.
- (b) Anchor units for Anti-Debris screen shall be stainless steel Acrow-Richmond Type DGRS-2 conforming to ASTM A276, Type 316 with minimum yield strength of 520MPa.

E17.5.32 Charcoal Holland Paver

- (a) Charcoal Holland Paver conforming to Specification E35 "Paving Stones for Indicator Surfaces". Measurement and Payment will be in accordance with Specification E36.

E17.5.33 Stainless Steel Dowels

- (a) Traffic barrier dowels shall conform to the requirements of ASTM A 955/A 955M Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement.
- (b) The dowels shall be fabricated to the details shown on the Drawings.

E17.5.34 Miscellaneous Materials

- (a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B7.
- (b) Benchmark Plugs
 - (i) Benchmark plugs shall be supplied by the City of Winnipeg. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be determined by the Contract Administrator.

E17.6 Equipment

E17.6.1 General

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

E17.6.2 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 have standby vibrators available at all times during the pour.

E17.6.3 Placing and Finishing Equipment for Overlay Concrete

- (a) Placing Equipment
 - (i) Adjacent exposed reinforcing steel shall be adequately protected during concrete placement.
- (b) Screed
 - (i) The Contractor shall use a mechanical screed to strike the surface of the superstructure 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 deck slab concrete meets the design elevations.
 - (iii) Screed rails shall not be allowed on the cantilever portion of the deck.
 - (iv) 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.
 - (v) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.
 - (vi) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.

- (vii) 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.
- (viii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).
- (ix) The supply, setup, operation, and takedown of the screed for deck slab concrete shall be considered incidental to the placement of the deck slab concrete. No separate measurement or payment shall be made for this Work.

E17.7 Construction Methods

E17.7.1 General

- (a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.
- (b) Rate of application shall be the rate required to meet the requirements of ASTM C309-98a for the texture of concrete the curing compound is being applied to.

E17.7.2 Temporary False Work, Formwork, and Shoring

- (a) Construction Requirements
 - (i) The Contractor shall construct falsework, formwork and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted shop drawings.
 - (ii) 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 superstructure.
 - (iii) The falsework, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted shop drawings.
 - (iv) 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.
 - (v) 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.
 - (vi) 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.
 - (vii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
 - (viii) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
 - (ix) 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.
 - (x) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
 - (xi) 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.
 - (xii) 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 matching colour of surrounding concrete.
- (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 his 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.

E17.7.3 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 E17.7.13, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E17.7.4 Bridge Deck Screeds

(a) Setting Deck Screeds

- (i) The Contractor shall adjust screeds to maintain uniform overlay thickness.
- (ii) Adjust screed heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases will be permitted to be drilled and grouted into existing concrete and shall be adjustable to achieve the required elevations.
- (iii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E17.7.5 Concrete Bridge Traffic Barrier Joints

- (a) For the joint sealing at all locations, the Contractor shall submit shop drawings and his proposed installation procedures to the Contract Administrator for approval fourteen (14) days prior to installation.
- (b) The installation of the fibre joint filler and the EMSEAL joint sealing shall be undertaken as shown on the drawings.
- (c) EMSEAL joint seals shall not be field spliced except when specifically permitted by the Contract Administrator in writing.
- (d) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods.
- (e) The EMSEAL joint sealing at the barrier joints shall be installed as per the Manufacturer's recommendations.
- (f) The supply and installation of EMSEAL joint sealing and fibre joint fillers shall be considered incidental to the Work, and no additional measurement or payment shall be made for this Work.

E17.7.6 Anchor Units for Aluminum Pedestrian Handrail/Bicycle Rail and Anti-Debris Screen

- (a) All anchor units shall be as specified on the Drawings.
- (b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.

E17.7.7 Permeable Formwork Liner

- (a) Permeable formwork liner shall be used on all exposed surfaces, except on soffit surfaces, or surfaces where a normal architectural form finish is specified.
- (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.

E17.7.8 Control Joint Seals

- (a) Formed control joints sealant for all horizontal, vertical and sloping joints shall be applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended.
- (b) Form control joints shall be thoroughly cleaned before sealing.

E17.7.9 Traffic Barrier Stainless Steel Dowels

- (a) Stainless steel dowels shall be installed as shown on the Drawings.
- (b) Each stainless steel dowel shall be held in place securely during concrete placement operations.
- (c) Half the dowel length shall be coated with asphaltic cut-back prior to concrete placement.

E17.7.10 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.

E17.7.11 Approach Slabs Works

- (a) The Contractor shall undertake the approach slab Works, as shown on the Drawings.

E17.7.12 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1-04, 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 twenty-four (24) hours prior to the scheduled placing of concrete.
 - (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
 - (iv) Unless otherwise noted in Table E17.1, "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 CSA A23.1-04 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 Owner 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 rehandling, 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:
 - ◆ Limit the amount to be placed at any time (using adequate construction joints);
 - ◆ Augment his facilities and Plant in order to complete the proposed placement; and,
 - ◆ In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.
- (ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E17.7.13 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 median curb and traffic barriers, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E17.7.14 Placing Structural Concrete

- (a) General
 - (i) The Contractor shall notify the Contract Administrator at least two (2) Working Days prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
- (b) Dry Run for Deck Slab Screed Machine
 - (i) 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.
- (c) Placing Structural Concrete

- (i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m²/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.
- (ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.
- (iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
- (iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
- (v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
- (vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (xi) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.
- (xii) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (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.
- (xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.
- (xiv) Before any concrete is placed for the approach slabs, or bridge deck 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 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.

E17.7.15 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 – Exposed Formwork Surfaces

- (i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes.
- (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.
- (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
- (iv) The surfaces shall be patched in accordance with the requirements of Sections E17.7.18 of this Specification.

(c) Type 2 Finish – Unformed Surfaces

- (i) All unformed concrete surfaces shall be finished as outlined hereinafter.
- (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
- (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
- (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- (v) For riding surfaces, after final floating, the overlay surface shall receive coarse transverse scored texture by drawing a steel tines broom uniformly across the overlay surface, to the satisfaction of the Contract Administrator. Tining pattern to be placed square to the barriers.
- (vi) For sidewalk, curb, and barrier surfaces, after final floating, the surface shall receive a broom finish applied uniformly across the surface, to the satisfaction of the contract administrator

(d) Type 3 Finish – Surfaces Below Finished Grade

- (i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E17.7.18 of this Specification.
- (ii) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E17.5.30 of this Specification.

E17.7.16 General Curing Requirements

- (a) Refer to E17.7.19 for cold weather curing requirements and E17.7.20 of this Specification for hot weather curing requirements.
- (b) Freshly finished concrete shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations and continuously wetted for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.

- (c) 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 twenty-four (24) hours. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in twenty-four (24) hours.
- (e) 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.
- (f) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the bridge deck overhang surfaces.
- (g) For curing of barriers, formwork shall remain in place for seven (7) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe. Following removal of the barrier formwork, curing compound shall be applied to all exposed faces.
- (h) Curing compound shall be applied at the rate required by ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

E17.7.17 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 for deck extensions shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads. Bridge deck overhang forms shall be loosened before forms are constructed and concrete is placed for bridge traffic barriers. Stripping of these forms shall not be permitted until a concrete strength of 28 MPa has been achieved by the deck slab concrete and the concrete bridge traffic barriers.
- (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.

E17.7.18 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 twenty-four (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 (1) 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.

E17.7.19 Cold Weather Concreting

- (a) The requirements of CSA Standard A23.1-04 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5°C during placing or curing.

E17.7.20 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 deck slab 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 E17-2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

TABLE E17-2: ACCEPTABLE CONCRETE TEMPERATURES		
THICKNESS OF SECTION	TEMPERATURE °C	
	MINIMUM	MAXIMUM
Less than:		
1.0 m	10	27
1.2 m	5	25

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

E17.8 Quality Control and Assurance

E17.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.
- (d) 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.
- (e) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.
- (f) 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.
- (g) Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

- (h) 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.
- (i) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-04. An outline of the quality tests is indicated below.
- (j) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E17.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.
- (d) Concrete Testing
 - (i) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-04, "Slump of Concrete". If the measured slump falls outside the limits in E23.5 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
 - (ii) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E23.5 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.
 - (iii) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-04, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
 - (iv) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202 and shall meet the requirements of each class of concrete.

- (v) Testing for post-cracking residual strength index of FRC shall be conducted at the Contractor's expense as follows: one set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399-04 without the steel plate. The average of the peak loads is the cracking load of the concrete (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). Specimens shall be sampled in accordance with E20.69.7. Testing shall include the specified number of specimens for the two mix categories stated in Table E17-1 for a total of two (2) complete tests. The Contractor shall promptly submit a summary of the test results to the Contract Administrator upon the conclusion of each test.
 - (vi) Testing for post-cracking residual strength index of FRC shall be tested as follows. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399-04 without the steel plate. The average of the peak loads is the cracking load of the concrete (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Specimens shall be sampled in accordance with E20.69.8.
 - (vii) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".
 - (viii) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-04, "Making and Curing Concrete Compression and Flexure Test Specimens".
 - (ix) 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-04, "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.
 - (x) 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 E20.1 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-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.
- (e) Corrective Action
- (i) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

E17.9 Measurement and Payment

E17.9.1 Supplying and placing structural concrete will be measured on a cubic metre basis. This Work shall be paid for at the Contract cubic metre Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(a) Items of Work:

Supply and Place Structural Concrete:

- (i) Bridge Deck Overlay
- (ii) Approach Slab Overlay
- (iii) Sidewalk Overlay with Monolithic Curb
- (iv) Wingwall Curbs
- (v) Median Slabs
- (vi) Median Curbs
- (vii) Traffic Barriers
- (viii) Abutment Shear Blocks

(b) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Place Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

(c) Heating concrete and housing and heating deposited concrete will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E18. CONCRETE REPAIRS

E18.1 Description

E18.1.1 This Specification shall cover all operations relating to the concrete repairs to the bridge deck and approach slab surfaces.

E18.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E18.2 Scope of Work

E18.2.1 The Work under this Specification shall involve the preparation and repair of concrete and reinforcing steel for:

- (a) Supplying and placing structural concrete for bridge deck and approach slab delamination repairs.

E18.3 Materials

E18.3.1 General

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in the Specification. All materials shall be new and within the recommended shelf-life, as approved by the Contract Administrator.

E18.3.2 Material for Concrete Repair

- (a) Structural Concrete
 - (i) The Contractor shall be responsible for supplying Concrete supplied as per Specification E 17 "Structural Concrete".

E18.3.3 Curing

- (a) All cementitious patches shall be wet cured for seven (7) Calendar Days unless otherwise approved by the Contract Administrator as per E17.7.16.

E18.4 Equipment

E18.4.1 General

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

E18.5 Construction Methods

E18.5.1 General

- (a) The Contractor shall ensure that existing concrete to remain is not be damaged.

E18.5.2 Debris and Cleanup

- (a) The Contractor shall be required to pick up and remove from the Site all debris created by the repair procedures to the satisfaction of the Contract Administrator.

E18.5.3 Preparation

- (a) The Contract Administrator will mark out areas requiring concrete repair. Additional areas may be added as the Work proceeds.
- (b) The resulting surface from concrete removals is to be roughened as per Specification E16 "Concrete Removal".
- (c) Limits of the repair areas are to be saw-cut per the Drawings to provide a well-defined interface and bonding surface with the existing sound concrete.
- (d) All corroded steel shall be sand blasted to remove all corrosion and have galvanic anodes installed as per Specification E21 "Discrete Galvanic Protection System".

E18.5.4 Bridge and Approach Slab Delamination Repair

- (a) Concrete shall be removed from around and behind all rebar in the area to be repaired accordance with good concrete repair practice such as ACRA guideline HB84-2006, Section 6. Concrete shall be removed to 25 mm below the lower bars for a Type 1 Repair. Exposed reinforcing steel shall be sand blasted to remove all corrosion and have galvanic anodes installed as per Specification E21 "Discrete Galvanic Protection System".
- (b) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates.
- (c) Repair areas shall be filled with Structural Concrete as per specification E17 "Structural Concrete" to elevations as shown on the drawings.
- (d) Positive deck drainage, greater than one percent (1%) slope, must be maintained throughout the deck, approach slabs, and all patched areas.
- (e) The Contract Administrator shall inspect all repaired areas for bond using a hammer "sounding" method following cure.
- (f) Cure in accordance with E17.7.16.

E18.6 Quality Control and Assurance

E18.6.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.
- (d) 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.

E18.6.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E18.7 Measurement and Payment

E18.7.1 Bridge Deck and Approach Slab Delamination Repair

- (a) The delamination repairs on the bridge deck and approach slabs will be measured on an area basis and paid for at the Contract Unit Price per square meter for "The Items of Work", listed here below which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

Items of Work:

- (b) Bridge Deck and Approach Slab Delamination Repair:
 - (i) Type 1

E19. SUPPLYING AND PLACING REINFORCING STEEL

E19.1 Description

E19.1.1 This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing and stainless steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

E19.1.2 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 Work as hereinafter specified.

E19.2 References

E19.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

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

- (b) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
- (c) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
- (d) CAN/CSA G30.18-M92 – Billet Steel Bars for Concrete Reinforcement;
- (e) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and,
- (f) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E19.3 Scope of Work

- E19.3.1 The Work under this Specification shall include the supplying, delivery, and installing of all reinforcing, as shown on the Drawings.

E19.4 Submittals

- E19.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its Operators.
- E19.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to commencement of any schedule Work on the Site, a proposed schedule, including methods and sequence of operations.
- E19.4.3 The Contractor shall submit to the Contract Administrator for review, 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.
- E19.4.4 Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on site.
- E19.4.5 Contractor to submit Quality Control Testing Program to the Contract Administrator in accordance with E19.8.

E19.5 Materials

E19.5.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) 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.
- (c) Bundles of reinforcing steel shall be identified by tags containing bar marks.
- (d) The reinforcing steel shall not be placed directly on the ground. Sufficient timber pallets or blocking shall be placed under the reinforcing steel to keep them free from dirt and mud.

E19.5.2 Handling and Storage of Stainless Steel Reinforcing

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

E19.5.3 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.
- (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 E24.1, "Type of Stainless Steel Reinforcing". Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.
- (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. No additional costs will be applied to this Contract for the replacement of deficient 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 CSA Standard CAN/CSA G30.18-M92 and ASTM A955M.

TABLE E24.1 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	EnduraMet 2304	S32304

E19.5.4 Bar Accessories

- (a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.
- (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:
- Black, soft-annealed 1.6 mm diameter wire or Nylon coated wire for black steel reinforcing; and,
 - Stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.
- (f) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator in accordance with B7.

- (g) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E19.5.5 Mechanical Splices for Stainless Steel Reinforcing Bars

- (a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, Type 316L, Type 2005, or Type 2304.
- (b) Mechanical splices for stainless steel reinforcing bars shall not be used unless approved by the Contract Administrator.

E19.5.6 Mechanical Splices for Existing Epoxy Coated Black Steel Reinforcing Bars

- (a) Mechanical splices for existing black steel reinforcing bars at deck drain removals shall be Zap Screwlok SL grade 400 or equivalent as approved by the Contract Administrator.

E19.6 Equipment

E19.6.1 General

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

E19.7 Construction Methods

E19.7.1 Fabrication of Reinforcing Steel

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

E19.7.2 Reinforcing Steel

- (a) Black Steel Reinforcing
 - (i) Heating shall not be used as an aid in bending black steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.
- (b) Stainless Steel Reinforcing
 - (i) Heating shall not be used as an aid in bending stainless steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.
 - (iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel wire brushes only.
 - (v) All hand tools shall be stainless tools that have not been used on carbon steel.

E19.7.3 Placing of Reinforcing Steel

- (a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.
- (b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete

which 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.

- (c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.
- (d) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.
- (e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. Bars with bends not shown on the Drawings shall not be used.
- (f) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.
- (g) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.
- (h) Reinforcing steel shall be placed within the tolerances specified in CAN/CSA A23.1.
- (i) 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.
- (j) 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 E19.5.4, "Bar Accessories"
- (k) Welding or tack welding is not permitted.
- (l) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.
- (m) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.

E19.7.4 Splicing

- (a) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings shall not be permitted without the written approval of the Contract Administrator.
- (b) 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.

E19.8 Quality Control and Assurance

E19.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.
- (d) 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.

E19.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E19.9 Measurement and Payment

- E19.9.1 Reinforcing steel bars will be measured on a mass basis and paid for at the Contract Unit Price per kilogram for the "Items of Work" listed below, which price shall be payment in full for supplying all material and for performing all operations herein described and all other items incidental to the Work included in this Specification accepted and measured by the Contract Administrator.

Items of Work:

- (a) Supply and Delivery of Reinforcing Steel:
 - (i) Stainless Steel Reinforcing
- (b) Placing Reinforcing Steel:
 - (i) Stainless Steel Reinforcing

- E19.9.2 Supplying and installing all the listed materials, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Delivery of Reinforcing Steel", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E20. TEMPORARY PROTECTION SYSTEM

E20.1 Description

- E20.1.1 This Specification shall cover all operations related to the design, supply, installation, maintenance and removal of temporary protective systems.
- E20.1.2 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 other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E20.2 References

- E20.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) Section D21, Environmental Protection Plan; and
- (b) Specification E16, Structural Removals.

E20.3 Scope of Work

E20.3.1 The Work under this Specification shall involve:

- (a) Demolition Catch Platforms and Work Platforms; and
- (b) Any other activities required to complete the Works.

E20.4 Submittals

E20.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any protection system installation, the Detailed Drawings, Specifications, and design notes for the protective systems, bearing the seal and signature of the Design Engineer.

- (a) The protective systems shall be designed by, prepared by, and bear the seal and signature of a Professional Engineer (Design Engineer) registered in the Province of Manitoba.
- (b) The submission of the protection system Detailed Drawings, Specifications, and design notes to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the design and safe and effective functioning of the protective system.

E20.4.2 The Contractor shall provide the Contract Administrator with proof that the protective systems are installed in accordance with the Detailed Drawings and Specifications. This proof shall be in the form of a letter bearing the seal and signature of protective systems' Design Engineer certifying that the protective system Design Engineer has carried out a personal inspection of the installation, and that the installation is in accordance with the design.

E20.5 Materials

E20.5.1 General

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

E20.6 Equipment

E20.6.1 General

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

E20.7 Construction Methods

E20.7.1 General

- (a) The Contractor shall be responsible for constructing the temporary protective systems.
- (b) The Contractor shall be fully responsible for ensuring the public safety in areas underlying and adjacent to the construction site. The Contractor will be responsible for any loss or damage caused as a result of the Contractor's actions. Any debris that enters the roadway envelope of a travelled lane shall be immediately cleaned up by the Contractor.

- (c) It can be suspended from the existing superstructure, supported from the existing ground, or otherwise. Any stay-in-place anchorages that are installed shall be stainless steel and shall be set back a minimum of 12 mm from the exposed surface, and subsequently grouted with a high quality grout. The details of any proposed anchorages or attachments to the existing structure shall be included in the submitted drawings of the temporary protective system, and subject to the approval of the Contract Administrator.

E20.7.2 Demolition Catch Platforms and Work Platforms

- (a) The Contractor shall provide all necessary access / work platforms to facilitate structural removals and associated inspection of all Works by the Contract Administrator.
- (b) The platforms shall be designed by the Contractor's Engineer to support the anticipated construction live load as well as any anticipated dead load resulting from fallen removal / demolition debris.
- (c) The platforms shall be designed to be of a type that does not detrimentally affect the structural integrity of the existing bridge structure.
- (d) The Contractor shall construct temporary protective systems to prevent debris, tools, forms, waste products, construction materials and equipment, and any material whatsoever from falling into the adjacent or below travelled lanes. The Contractor shall take all necessary safety precautions to ensure that no materials leave the construction work areas and subsequently enter the roadway envelope during the Contractor's construction operations. The roadway envelope of any travelled lane is defined as follows:
 - (i) Horizontally, it is the space occupied from hypothetical lane edge to lane edge.
 - (ii) Vertically, the existing vertical clearances shall be maintained at all times.
- (e) For work above the travelled lanes, a catch platform system shall be provided. For work beside traffic, a protective wall system shall be provided. Together, these items shall be referred to as the temporary protective systems. The Contractor shall be responsible for the design, supply, installation, maintenance and removal of the temporary protective systems.
- (f) The systems shall include but not necessarily be limited to platforms beneath the deck, extending beyond the proposed edge of new deck along both exterior edges of the bridge and other catch platforms beneath the bridge superstructure and abutting the piers, as required for construction purposes, and to collect and contain products of demolition, hydrodemolition and all other debris, and prevent them from falling onto underlying surfaces.
- (g) The protective systems shall be designed and constructed as required to catch and retain all products of demolition, including those produced by hydrodemolition. Collection and containment information and details associated with the demolition catch platform as related to control and containment of products of hydrodemolition including runoff from hydrodemolition shall form part and parcel of the hydrodemolition runoff control plan detailed in E19, Structural Removals.

E20.8 Quality Control and Assurance

E20.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E20.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E20.9 Measurement and Payment

- E20.9.1 Design, supply, installation, maintenance and removal of temporary protective systems will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Temporary Protective System/Work Platform", which price shall be payment in full for supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E21. DISCRETE GALVANIC PROTECTION SYSTEM

E21.1 Description

- E21.1.1 The Work under this section consists of designing, supplying, and installing a zinc-based galvanic corrosion control system consisting primarily of embedded zinc anodes, including required electrical connections, materials, testing and ensuring continuity of the reinforcing steel to all elements as outlined on the Drawings.
- 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 References

- E21.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
 - (a) ACI/ICRI 1999 Concrete Repair Manual
 - (b) ACI Guideline No. 222 – Corrosion of Metals in Concrete
 - (c) ACI 562-13 Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings
 - (d) ACI Repair Application Procedure (RAP) Bulletin 8 – Installation of Embedded Galvanic Anodes (2010)
 - (e) ICRI Guideline 310.1R-2008 Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion
 - (f) ASTM B418-12 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes

E21.3 Submittals

E21.3.1 Shop drawings showing typical galvanic corrosion control system installation details, such as distributed anode installation locations, type, and location of anode standoff spacers, reinforcing connections shall be prepared by the Contractor and submitted for approval prior to any field installations. The shop drawings shall clearly illustrate the layout of the anodes as applies to the abutments on this project, in both elevation and section views.

E21.4 Materials

E21.4.1 Embedded Galvanic Anodes

- (a) Discrete galvanic units shall be alkali-activated zinc meant to be embedded into concrete repairs and for corrosion prevention only. Nominal dimensions shall be:
 - (i) For Galvashield® XPT anodes: 100mm x 24mm x 28mm or as approved. The anodes shall be pre-manufactured with a nominal 60 grams of zinc respectively in compliance with ASTM B418 Type II cast around a pair of uncoated, non-galvanized steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14 or greater.
- (b) The galvanic anodes shall be alkali-activated and shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACT 562-13. Anode units shall be supplied with integral unspliced wires for directly tying to the reinforcing steel. Embedded galvanic anodes shall be Galvashield® XPT, as shown on the Drawings, available from Vector Corrosion Technologies (www.vector-corrosion.com) USA (813) 830-7566, Canada (204) 489-9611 or approved equal.
- (c) Application for approved equals shall be requested in writing two (2) weeks before submission of project bids. Application for galvanic anode approved equals shall include verification of the following information:
 - (i) The zinc anode is alkali-activated with an alkaline cementitious shell with a pH of 14 or greater.
 - (ii) The galvanic anode shall contain no intentionally added constituents corrosive to reinforcing steel, e.g. chloride, bromide, etc.
 - (iii) The anode manufacturer shall provide documented test results from field installations showing that the anodes have achieved a minimum of 10 years in service.
 - (iv) The galvanic anode shall have been used in a minimum of ten projects of similar size and application.
 - (v) The galvanic anode units shall be supplied with solid zinc core (ASTM B418) cast around uncoated, non-galvanized, non-spliced steel tie wires for wrapping around the reinforcing steel and twisting to provide a durable steel to steel connection between the tie wire and the reinforcing steel.
 - (vi) The anode manufacturer shall provide third party product evaluation, such as from Concrete Innovations Appraisal Service, BBA, etc.

E21.4.2 Repair Materials

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

E21.4.3 Storage

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

E21.5 Equipment

E21.5.1 General

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

E21.6 Construction Methods

E21.6.1 General

- (a) The galvanic corrosion protection shall consist of the anodes as indicated on the Drawings. The anode units are connected to the reinforcing steel and encased in a concrete with a minimum of 50 mm of clear concrete cover over the anode units.

E21.6.2 Manufacturer Corrosion Technician

- (a) The Contractor will enlist and pay for a technical representative employed by the galvanic anode manufacturer to provide training and on-site technical assistance during the initial installation of the galvanic anodes. The technical representative shall be a NACE-qualified corrosion technician (Cathodic Protection Technician–CP2 or higher).
- (b) The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.
- (c) The Contractor shall coordinate its work with the designated corrosion technician to allow for site support during project start-up and initial anode installation. The corrosion technician shall provide Contractor training and support for development of application procedures, verification of electrical continuity, and project documentation.

E21.6.3 Concrete Removal

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

E21.6.4 Cleaning and Repair of Reinforcing Steel

- (a) Clean exposed reinforcing steel of rust, mortar, epoxy coating, etc. to provide sufficient electrical connection and mechanical bond.
- (b) If significant reduction in the cross section of the reinforcing steel has occurred, replace or install supplemental reinforcement as directed by the Contract Administrator.
- (c) Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.
- (d) Verify electrical continuity of all reinforcing steel, including supplemental steel, as per Section E21.6.6(f).

E21.6.5 Edge and Surface Conditioning of Concrete

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

E21.6.6 Galvanic Anode Installation

- (a) Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.

- (b) Anode spacing shall be such to provide full protection for the entire patch perimeter. Anode spacing is dependent on the reinforcing steel density. Maximum anode spacing shall be as per the manufacturer's guidelines to provide a 50 years service life.
- (c) Place the galvanic anodes as close as possible to the patch edge while still providing sufficient clearance between anodes and substrate to allow the repair material to fully encase the anode with a minimum concrete or mortar cover over the anode of 25mm. If necessary, increase the size of the repair cavity to accommodate the anodes.
 - (i) Place the anode such that the preformed BarFit™ groove fits along a single bar or at the intersection between two bars and secure to each clean bar.
 - (ii) If less than 25 mm of concrete cover is expected, place anode beneath the bar and secure to clean reinforcing steel.
- (d) The tie wires shall be wrapped around the cleaned reinforcing steel at least one full turn in opposite directions and then twisted tight to create a secure electrical connection and allow no anode movement during concrete placement.
- (e) Repair materials with resistivity greater than 50,000 ohm-cm are not to be used.
- (f) Electrical Continuity
 - (i) Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm Ω) or DC potential (mV) with a multi-meter.
 - (ii) Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 Ω or less or the DC potential is 1 mV or less.
 - (iii) Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established by tying discontinuous steel to continuous steel using steel tie wire.
 - (iv) Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is 1 Ω or less or the potential is 1 mV or less.
- (g) The discrete galvanic anodes will be connected to the existing, exposed reinforcement. Provide electrical continuity with new dowels embedded into existing concrete as per Manufacturer's guidelines to provide a 50-year design life. Proposed electrical connection details shall be approved by the anode manufacturer and shall be detailed on the shop drawing submittal. Anodes do not need to be connected to corrosion resistant reinforcement (e.g. stainless steel reinforcement).

E21.6.7 Concrete or Mortar Replacement

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

E21.7 Measurement and Payment

E21.7.1 Discrete Galvanic Anode System

- (a) The supply and installation of Discrete Galvanic Protection System as shown on the Drawings will be measured on a Unit Basis and paid for at the Contract Unit Price Per Unit for "Discrete Galvanic Anode System" which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

E22. DRILLING AND PLACING DOWELS

E22.1 Description

- E22.1.1 This Specification shall cover all operations related to drilling and preparation of dowel holes, supply and placing epoxy grout and installation of the applicable anchorages.

E22.1.2 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 Work as hereinafter specified.

E22.2 References

E22.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) Specification E16, Structural Removals; and
- (b) Specification E19, Supplying and Placing Reinforcing Steel.

E22.3 Scope of Work

E22.3.1 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:

- (a) Dowels shall include the following post-installed anchorages and reinforcing bars:
 - (i) Dowels for Overlays
 - (ii) Dowels for Median Curbs
 - (iii) Dowels for Wingwall Curbs

E22.4 Submittals

E22.4.1 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.

E22.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E22.5 Materials

E22.5.1 General

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

E22.5.2 Epoxy grout

- (a) Epoxy grout shall be Hilti HIT-RE 500-V3 or equivalent as approved by the Contract Administrator. The epoxy grout shall be suitable for horizontal, vertical or overhead dowel grouting application as required.

E22.6 Equipment

E22.6.1 General

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

E22.7 Construction Methods

E22.7.1 General

- (a) The Contractor shall core or drill holes and place dowels at the locations and in accordance with the details as shown on the Drawings.

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

E22.8 Quality Control and Assurance

E22.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E22.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E22.9 Measurement and Payment

E22.9.1 Drilling and Placing Dowels:

- (a) Drilling and placing dowels will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Drilling and Placing Dowels", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) The supply of reinforcing steel for the dowels will be measured and paid for in accordance with Specification E19, Supplying and Placing Reinforcing Steel.

E23. ALUMINUM PEDESTRIAN HANDRAIL/BICYCLE RAIL

E23.1 Description

E23.1.1 This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail/bicycle rail as specified herein and as shown on the Drawings.

E23.1.2 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 other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E23.2 References

E23.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;
- (b) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;
- (c) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;
- (d) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;
- (e) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;
- (f) CAN/CSA W59.2 – Welded Aluminum Construction;
- (g) CAN/CSA S157 – Strength Design in Aluminum.

E23.3 Scope of Work

E23.3.1 The Work under this Specification shall include:

- (a) Supplying and installing aluminum pedestrian handrail / bicycle rail;
- (b) Supplying and installing all miscellaneous steel items and other items associated with the Work.

E23.4 Submittals

E23.4.1 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.

E23.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail/bicycle rail. Fabrication shall take place as shown on the Drawings.

E23.4.3 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in B13 and mill certificates.

E23.4.4 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

- (a) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
- (b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

- (c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding.

E23.5 Materials

E23.5.1 General

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

E23.5.2 Aluminum Pedestrian Handrail/Bicycle Rail

- (a) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6).
- (b) Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.
- (c) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316. Anti-Debris screen hardware shall have a minimum yield strength of 520 MPa.

E23.5.3 Bituminous Paint

- (a) Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187. Supply of bituminous paint shall be considered incidental to the supply of aluminum pedestrian handrail.

E23.5.4 Handrail Anchorage System

- (a) The handrail anchorage system is specified and paid for in accordance with E17, "Structural Concrete".

E23.5.5 Aluminum Shims

- (a) Aluminum shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the Drawings. Supply of shims will be considered incidental to the supply of aluminum pedestrian handrail.

E23.5.6 Aluminum Filler Alloys for Welded Construction

- (a) Aluminum filler alloys for welded construction shall be one (1) of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654.

E23.5.7 Hinges

- (a) Hinges shall be stainless steel and manufactured by Angama, Type STBB 460, or equal as approved by the Contract Administrator in accordance with B7, "Substitutes".

E23.6 Equipment

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

E23.7 Construction Methods

E23.7.1 Layout

- (a) Before fabrication and/or installation of the aluminum pedestrian handrail, the Contractor shall satisfy himself of all required aluminum rail and enclosure section dimensions, by field measurements.

E23.7.2

Fabrication

(a) General

- (i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.
- (ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.
- (iii) The Fabricator shall fabricate the entire aluminum pedestrian handrail/bicycle rail in sections, to permit the installation of the rail sections onto the concrete.
- (iv) The punching of identification marks on the members will not be allowed.
- (v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.
- (vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.
- (vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

(b) Sample Panel

- (i) The Contractor shall be required to supply the Contract Administrator with one (1) completely fabricated handrail/bicycle rail sample panel, including at least two (2) posts, prior to proceeding with the fabrication of the remainder. The sample, once accepted, shall be identifiable for the duration of the Project, but may be incorporated into the rail system. It shall become the standard for acceptance of all aluminum pedestrian handrail/bicycle rail panels.

(c) Cutting

- (i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

(d) Welding

- (i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.
- (ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.
- (iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:
 - ◆ Guided Bend Test: All bend tests should be fully guided through an angle of 180°. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the

thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness. Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.

- ◆ Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four (4) sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed three percent (3%) of the area under inspection.

(e) Bolting

- (i) Bolt holes in 10 mm or thinner material may be drilled or punched to finished size. In material thicker than 10 mm, the holes shall be drilled to finished size or subpunched smaller than the normal diameter of the fastener and reamed to size.
- (ii) The finished diameter of the holes shall be not more than seven percent (7%) greater than the nominal diameter of the fastener, except:
 - ◆ Slotted holes for expansion purposes shall be provided as required on the Drawings.
 - ◆ Holes for anchor bolts may be up to 50 percent greater than the nominal bolt diameter with a maximum of 13 mm greater than the nominal bolt diameter.
 - ◆ Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.
 - ◆ In all bolts, the finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are tightened.

E23.7.3 Installation of Aluminum Pedestrian Handrail/Bicycle Rail

- (a) The aluminum pedestrian handrail/bicycle shall be brought on-site and accurately installed as shown on the Drawings.
- (b) The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.
- (c) The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted. The Contractor shall report to the Contract Administrator any corrective measures.
- (d) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be separated with a minimum of two (2) coats of bituminous paint. A minimum 3 mm aluminum shim shall be installed under each post.

E23.8 Quality Control and Assurance

E23.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E23.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E23.9 Measurement and Payment

- E23.9.1 Supplying and installing the aluminum pedestrian handrail/bicycle rail will be measured on a length basis and paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Pedestrian Handrail/Bicycle Rail", 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 included in this Specification, accepted and measured by the Contract Administrator.

E24. EXPANSION JOINTS

E24.1 Description

- E24.1.1 This Specification shall cover the supply and installation of expansion joints and its components, traffic barrier mounting plates, cover plates, end plates, nuts and anchors, as shown on the Drawings and as specified herein.
- E24.1.2 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 other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E24.2 References

- E24.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
- (a) MTI Standards Construction Specification 1065(I) "Supply, Fabrication, and Installation of Expansion Joints"
 - (b) ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
 - (c) ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

- (d) ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
- (e) ASTM D573 – Standard Test Method for Rubber – Deterioration in an Air Oven
- (f) ASTM D1149 – Standard Test Method for Rubber Deterioration – Surface Ozone Cracking in a Chamber
- (g) ASTM D1171 – Standard Test Method for Rubber Deterioration – Surface Ozone Cracking Outdoors (Triangular Specimens)
- (h) ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness
- (i) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- (j) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- (k) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding)
- (l) OPSS 1210, "Material Specification for Preformed Neoprene Joint Seals"

E24.3 Scope of Work

- E24.3.1 The Work under this Specification shall include the design, fabrication, supply, and installation of expansion joints and associated plates, angles, and other hardware.

E24.4 Submittals

- E24.4.1 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.
- E24.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.
- E24.4.3 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of fabrication, a complete set of Shop Drawings sealed, signed, and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba in accordance with E2 "Shop Drawings". No fabrication shall commence until acceptance of the shop drawings from the Contract Administrator has been obtained. The Contractor shall indicate on the Shop Drawings the necessary material specifications for all materials to be used, fabrication details and proposed field splice details of the steel components. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings.
- E24.4.4 The Contractor shall submit to the Contract Administration for review and approval, at least ten (10) Business Days prior to commencement of fabrication, copies of Mill Test Certificates showing chemical analysis and physical tests of all steel. Steel without this certification will be rejected.
- E24.4.5 The Contractor shall submit to the Contract Administration for review and approval, at least ten (10) Business Days prior to commencement of fabrication, copies of all material tests, including all chemical analysis and physical tests, for all materials, as specified in this Specification.

E24.5 Materials

E24.5.1 General

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

- (b) 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.

E24.5.2 Expansion Joints

- (a) Expansion joints shall be molded rubber segmental expansion joint system located at ballast walls at South and North Abutments, as shown on the Drawings.
- (b) The molded rubber segmental expansion joints shall be a Wabo Transflex 250 Joint System, as specified on the Drawings, and supplied by Watson Bowman Acme Corp, or equal as accepted by the Contract Administrator in accordance with B7.
- (c) Molded rubber segmental expansion joints shall have fabricated cover plates and slider plates as shown on the Drawings.
- (d) All fasteners and hardware of the molded rubber segmental bridge deck expansion joints shall be galvanized in accordance with ASTM A153/A153M to a minimum net retention of 610 g/m².
 - (i) The zinc coating shall be adherent, continuous, and reasonably smooth. It shall be free from imperfections such as blisters; gritty or uncoated areas; acid, black spots, or dross particle adhering to the coating; or other imperfections inconsistent with good commercial galvanizing practice. Globules of zinc that will interfere with the intended use of the material will not be permitted. The colour of the galvanizing shall be consistent and continuous.
 - (ii) Galvanizing touch-up repair product shall be Galvalloy. Galvalloy shall be as supplied by Metalloy Products Company, P.O. Box #3093, Terminal Annex, Los Angeles, California. Locally, this is available from Welders Supplies Ltd., 25 McPhillips Street.

E24.5.3 Miscellaneous Steel Items

- (a) Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to CSA Standard CAN/CSA-G40.21, Grade 300W and shall be galvanized in accordance with CSA Standard CAN/CSA-G164 to a minimum net retention of 610 g/m².

E24.5.4 Anchor Studs

- (a) Anchor studs shall conform to the requirements of ASTM Specification A108, Grade Designation 1020 and shall be galvanized.

E24.5.5 Welding

- (a) Welding shall be of a low oxygen classification. Manual electrodes shall be E7016 or E7018. All welding shall be in accordance with CSA Standard W59.

E24.5.6 Elastomeric Molded Panels

- (a) The elastomeric molded panels shall be comprised of a formed steel shape suspended in an elastomeric material. The profile-riding surface shall have imbedded wear plates to ensure skid resistance and shall be capable of accommodating traffic loads. Each elastomeric molded panel shall be supplied with integrated bolt hole cavities and tongue and groove end connections.
- (b) The elastomer used to mold the panels shall be manufactured of a neoprene compound exhibiting the physical properties listed in table E24.1 below.

Table E24.1 Physical Requirements		
PROPERTY	PHYSICAL REQUIREMENTS	TEST PROCEDURE
1.Tensile Strength	Minimum 1800 psi (12.4 MPa)	D-412-98A

2.Elongation at Break	Minimum 400%	D-412-98A
3.Hardness, Type A Durometer	40-50	D-2240-02
4. Compression Set, 22hrs@158°F (70°C), Method B (modified)	Maximum 20%	D-395-01
5. Oil Swell, ASTM #3 Oil, 70hrs at 212°F (100°C) Volume Change	120%	D-471-98
6. Ozone Resistance, 20% Strain, 100pphm in air 70 hrs@104°F (40°C) (wipe with toluene to remove surface contamination)	No Cracks	D1149-99
7. Low Temperature, brittleness (3min@-40°F)	Not Brittle	D-746-79 (1987)

E24.5.7 Steel Angle

- (a) The steel angles imbedded in the molded neoprene panels are formed from ASTM A-36 steel.

E24.5.8 Bolt Cavity Sealant

- (a) Bolt hole cavities shall be filled using a two-part polyurethane sealant that meets Federal Specification TT-S-00227E. The Contractor shall ensure that the anchor bolts are dry from moisture prior to placement of material.

E24.5.9 Edge Void Sealant

- (a) Edge voids shall be filled with a one-part polysulfide base synthetic rubber sealant confirming to Federal Specification TT-S00230C Type II Non-Sag. The Contractor shall ensure that the anchor blocks are dry from moisture prior to placement of material.

E24.5.10 Bedding Compound

- (a) Apply edge void sealant as a bedding material to the blockout base prior to placement of the elastomeric gland. Material shall be a one-part polysulfide base synthetic rubber sealant confirming to Federal Specification TT-S-00230C Type II Non-Sag.

E24.5.11 Threaded Rods

- (a) Threaded Rods shall be Hilti HAS or equivalent as approved by the Contract Administrator.

E24.5.12 Epoxy Adhesive for Threaded Rods

- (a) Epoxy grout shall be Hilti HVU or equivalent as approved by the Contract Administrator.

E24.5.13 Epoxy Adhesive for Metal Plates

- (a) Epoxy adhesive shall be ST 431, Dural Duralbond, Copper Capbound E, Sikadur 32 Hi-bond, Concrevice 1001 LPL, or equal as accepted by the Contract Administrator in accordance with B7.

E24.5.14 Epoxy Grout

- (a) Grout shall be non-metallic, non-shrink grout of a type approved by the Contract Administrator.

E24.5.15 Grout

- (a) Grout shall be nonmetallic and nonshrink grout. Acceptable grouts are: Master Builders Set Nonshrink Grout, Sika Grout 212, Sternson M-Bed Standard Grout, CPD Nonshrink Grout, or equal as accepted by the Contract Administrator in accordance with B7.

E24.5.16 Epoxy Adhesive Strip

- (a) Epoxy adhesive strip shall be 50 mm wide Flex-Tred nonslip adhesive strip or equal as accepted by the Contract Administrator in accordance with B7.

E24.5.17 Miscellaneous Steel Items

- (a) Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to the requirements of CAN/CSA G40.21, Grade 300W and shall be galvanized in accordance with CAN/CSA G164 M92 to a minimum net retention of 610 g/m².
- (b) The sidewalk cover plates shall be coated with epoxy adhesive strip.

E24.6 Equipment

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

E24.7 Construction Methods

E24.7.1 General

- (a) The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall be responsible for the joint installation procedure.
- (b) The manufacturer shall have a minimum of ten (10) years of experience specializing in the design and manufacture of expansion control systems.
- (c) Care shall be taken to ensure that all members are straight and flat and free from twists, bends, and distortions due to welding. The cover and sliding plate units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall, as well as accurate positioning and alignment. The molded panels shall be shop checked for matching of sliding surfaces, correct cross-fall, mitres, as well as accurate positioning and alignment of adjacent sections. The Contractor shall exercise care in the handling of all units to prevent twists, bends, and warping.
- (d) Expansion joint assemblies shall be shop checked for fit and match marked.
- (e) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint, and other foreign material by commercial sand, grit or shop blasting, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.
- (f) Any components that, in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

E24.7.2 Design, Fabrication, and Supply

- (a) Expansion joints shall be designed by the expansion joint supplier. Expansion joints shall be designed and fabricated in accordance with the requirements of AASHTO LRFD Bridge Design Specifications (9th Edition) and AASHTO LRFD Bridge Construction Specifications (4th Edition).
- (b) Joints shall be designed to accommodate the anticipated thermal expansion / contraction requirements based on an 80°C temperature range plus a minimum additional 20 mm of expansion movement and 7 mm of contraction movement.

- (c) The manufacturer instructions for the proper installation of the joint system shall be detailed on the shop drawings. Shop drawings which lack manufacturer installation instruction, may be returned without approval.
- (d) The device shall be accurately set and securely supported at the correct grade and elevation and the correct joint opening as shown on the Drawings and on the shop drawings.

E24.7.3 Installation

- (a) The Contractor shall install expansion joints according to the manufacturer's specifications and as shown on the Drawings and shall be responsible for the correct matching and seating of parts. The expansion joints shall be checked for accurate matching of sliding plates with the bridge deck expansion joints installed at the specified skews and crossfalls.
- (b) The Contractor is required to provide support for the expansion plates during placement of concrete. The Contractor may propose alternate methods of support for approval to the Contract Administrator. All support systems shall not interfere with concrete finishing operations and shall be a minimum 150 mm away from the top surface of the concrete.

E24.7.4 Galvanizing Touch-up Prior to Placement of Concrete

- (a) Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.
- (b) Surfaces to be reconditioned with paints containing zinc dust shall be clean, dry, and free of oil, grease, pre-existing paint, and corrosion by-products. The galvanized steel surface shall be cleaned to remove all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by hand chipping, scraping, sanding, and wire brushing.
- (c) Surface preparation shall extend into the undamaged galvanized coating to ensure that the smooth recondition coating can be affected. All prepared surfaces shall be inspected and approved by the Contract Administrator prior to application of any galvanizing spray.
- (d) Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.
- (e) The process is to be repeated as required to achieve a thickness comparable to original galvanizing.

E24.7.5 Watertight Verification of Joint

- (a) Prior to installing the expansion joint and barrier cover plates, the Contractor shall isolate the expansion joints and maintain a minimum of 75 mm of water over all areas of the joint for a period of not less than four (4) hours, with no leakage. This shall also include verification of leakage between the molded panels joints and the concrete blockout. Any and all leaks shall be corrected, using mechanical or other adjustment of the expansion joints to the satisfaction of the Contract Administrator. In no case shall caulk or other temporary devices or materials be used to seal leaks in the expansion joints. The Contract Administrator's decision in this regard shall be final.
- (b) Prior to commencing the test, the Contractor shall remove all expansion joint forming materials and debris from the deck and from the substructure units below. The Contractor shall provide safe access, acceptable to the Contract Administrator, to the abutments for inspection of the expansion joints during testing.

E24.8 Quality Control and Quality Assurance

E24.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to the close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work.
- (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.

E24.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E24.8.3 Markings

- (a) All molded panels shall be identified as to the manufacturer by means of a continuous permanent mould mark. The mould marks shall be registered with the Contract Administrator and shall be used on all molded panels produced by the respective manufacturer. The molded panels shall also be permanently marked, with the date of production and the batch/lot.
- (b) The Contractor shall supply to the Contract Administrator a summary of the molded panels identifying the data of manufacture, the batch/lot, and the proposed installation location.

E24.8.4 Samples and Testing Procedures

- (a) The Contractor shall supply sample material at no charge to the Owner for quality control testing purposes. As soon as the molded panels to be used for the joints have been manufactured, they shall be available to the Contract Administrator for sampling.
- (b) Testing procedures will be in accordance with the latest revisions of the methods indicated on Table E24.1.
- (c) Requirements shown in Table E24.1 reflect test results taken immediately following compound mixing. Results may vary and are not indicative of product performance if specimens are skived from finished, molded parts.
- (d) All materials failing to meet the Specification requirements will be rejected.
- (e) Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

E24.8.5 Guarantees

- (a) Fabrication Warranty

- (i) Before final acceptance of the expansion joints by the Contract Administrator, the Contractor shall provide the City of Winnipeg with a written warranty from the expansion joint supplier stating that they will perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of Substantial Performance, provided that the expansion joints have been properly installed, acceptable to the Contract Administrator. The Supplier shall state that they have observed the installation and found it to be in accordance with their recommended procedure. The Supplier shall warranty the replacement of the joints, including removal of the defective expansion joint assemblies and supply and installation of the replacement expansion joint, at no cost to the City of Winnipeg, in the event that the joint does not perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of Substantial Performance.
- (b) Installation Warranty
 - (i) The Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication warranty.
 - (ii) Similar to the expansion joint Supplier, and prior to final acceptance by the Contract Administrator, the Contractor shall warranty, in writing, the performance of the expansion joints for a period of five (5) years from the date of Substantial Performance. The Contractor shall provide in the warranty for the replacement of the expansion joints at no cost to the City of Winnipeg, including all direct and indirect costs in the event the expansion joints do not perform satisfactorily in the range of design movement and under the design loads for a period of five (5) years from the date of Total Performance.

E24.9 Measurement and Payment

- E24.9.1 The Supply and Installation of Expansion Joints will be measured on a per metre basis. This Item of Work will be paid for at the Contract lineal metre Price for the "Supply and Installation of Expansion Joints", which price shall be payment in full for supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E25. PENETRATING CONCRETE SEALER

E25.1 Description

- E25.1.1 This Specification shall cover all operations relating to the supply and installation of penetrating concrete sealer as specified here in and as shown on the Drawings
- E25.1.2 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 Work as hereinafter specified.

E25.2 References

- E25.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
- (a) Section D21, Environmental Protection Plan; and
 - (b) Specification E16, Structural Removals.

E25.3 Scope of Work

- E25.3.1 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:

- (a) An approved Type IC silicone sealer shall be applied to all exposed concrete surfaces of Abutments.
- (b) An approved Type IC silicone sealer shall be applied to all exposed concrete surfaces of the splash zones on the Piers, as shown on the Drawings.

E25.4 Submittals

- E25.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- E25.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E25.5 Materials

E25.5.1 General

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

E25.5.2 Penetrating Concrete Sealer

- (a) An approved Type IC silicone sealer is Sikagard SN100, PENTREAT 244-100 or equal as accepted by the Contract Administrator, in accordance with B7.

E25.6 Equipment

E25.6.1 General

- (a) All equipment shall be a type approved by the Contract Administrator and shall be kept in good working order.

E25.7 Construction Methods

E25.7.1 Type IC Sealer

- (a) The sealer shall be applied in accordance with the Manufacturer's recommendations; however, the application rate shall be increased by 30% from that indicated on the approved Product Sheet.
- (b) Before applying the sealer, new concrete shall be cured for at least 28 days.
- (c) The concrete surface shall be cleaned of existing paint coatings, dry, and air blasted to remove all dust and accepted by the Contract Administrator prior to applying sealer.
- (d) In order to ensure uniform and sufficient coverage rates the Contractor shall apply measured volumes of sealing compound to appropriately dimensioned areas of concrete surface, using a minimum of 2 coats.
- (e) Asphalt concrete pavement surfaces shall be adequately protected from overspray and runoff during sealer application.

E25.8 Quality Control and Assurance

E25.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E25.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E25.9 Measurement and Payment

- E25.9.1 The supply and installation of penetrating concrete sealer will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Penetrating Concrete Sealer" which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E26. CONCRETE CRACK INJECTION

E26.1 Description

- E26.1.1 This Specification shall cover all operations relating to the epoxy injection of concrete cracks located on the abutment surfaces as shown on the Drawings and as directed by the Contract Administrator.
- E26.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tolls, supplies, and all things necessary for and incidental to the satisfactory performance, and completion of all Works as herein specified.

E26.2 References

- E26.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
 - (a) Specification E16.

E26.3 Scope of Work

- E26.3.1 The Work under this Specification shall include surface preparation and epoxy injection of concrete cracks located on the bridge abutment surfaces, as shown on the Drawings and as identified by the Contract Administrator.

E26.4 Submittals

- E26.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the commencement of any scheduled Work on the Site,

four (4) copies of the crack repair work plan. The crack repair work plan shall bear the seal and signature of an Engineer and include at the minimum the following information:

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

E26.5 Materials

E26.5.1 General

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

E26.5.2 Epoxy Resin

- (a) Material used for crack injection shall be epoxy resins for passive cracks.
- (b) Epoxy grout shall prevent the penetration of water and shall have sufficient flowability to fill the crack at least 80% of the depth of the crack using the proposed equipment and method of repair at the ambient and substrate temperatures existing at the time of grouting.
- (c) Epoxy resin shall be moisture insensitive and 100% solids.

E26.5.3 Equipment

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

E26.5.4 Gauges

- (a) In addition to the calibrated gauges required for use with the pumps and with the injection hose, additional gauges shall be available on site to replace those that malfunction.
- (b) Certificates of calibration, from an organization accredited by the Standards Council of Canada shall be supplied for each gauge certifying that the gauges are capable of measuring the pressure within a tolerance of ± 5 kPa.

E26.5.5 Pumps

- (a) Equipment used for pressure injection shall be suitable for the intended use and compatible with the grout.
- (b) Pumps shall be positive displacement type and shall be capable of delivering a minimum of two litres of grout per minute.
- (c) Pumps shall be capable of developing a maximum regulated operating pressure at least equal to twice the effective pressure.
- (d) Pumps shall be equipped with a calibrated gauge and shall be capable of accurately maintaining an effective operating pressure of 50 kPa or less.
- (e) Plural component pumps shall be used when multicomponent solution grouts are used.
- (f) Hand cartridge pumps shall not be used unless the volume of crack repair is less than one litre of resin for 100 m² of gross repair area.

E26.5.6 Static In-Line Mixers

- (a) Static in-line mixers shall produce a homogeneous grout and shall be sized to accommodate the minimum and maximum anticipated flow rates.
- (b) Static mixers shall have the manufacturer's plate attached showing the following mixer information:
 - (i) Size.
 - (ii) Type.
 - (iii) Maximum operating pressure.

E26.5.7 Agitating Mixer

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

E26.5.8 Injection Hoses

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

E26.5.9 Injection Ports

- (a) Injection ports shall be removable or non-metallic insert type units. The pressure capacity of the injection ports shall be at least equal to the maximum operating pressure of the pump. All injection ports shall be equipped with a shut-off valve or other mechanical means of closure under pressure.
- (b) Surface mounted injection ports shall not be used.

E26.5.10 Air Compressor

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

E26.5.11 Drills

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

E26.5.12 Concrete Router

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

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.

E26.7 Construction Methods

E26.7.1 General

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

E26.7.2 Crack Injection

(a) Drilling for Injection Ports

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

(b) Cleaning and Flushing

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

(c) Surface Preparation and Sealing

- (i) Surface opening of the cracks shall be sealed prior to injection.
- (ii) The surface of the concrete shall be mechanically cleaned for a distance of 25 mm each side of the crack sections to prepare a clean substrate for bonding of the surface sealing compound. The surface preparation and sealing shall be as recommended by the manufacturer of the surface sealing material.
- (iii) The surface sealing material shall completely confine the injection grout to the crack section with only the injection ports providing access. The surface sealing material shall withstand the maximum injection pressure without developing leakage along the crack section.

- (iv) Surface sealing of passive cracks shall not commence until at least one hour after the final air flush.

E26.7.3 Injection of Epoxy

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

E26.7.4 Monitoring

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

E26.7.5 Effective Pressure

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

E26.7.6 Ratio Test

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

E26.7.7 Pot Life Determination

- (a) Prior to commencing the grouting operation, a sample shall be taken from the material containers on site and manually proportioned to the specified component ratio in the presence of the Contract Administrator. The total sample size shall be 200 ml, and the same size container shall be used for each sample taken.
- (b) The temperature of the material at the time of mixing and the pot life of the mixed material shall be recorded.
- (c) The proportions of materials and pot life shall conform to those specified in the original submissions.
- (d) An additional sample shall be taken from the end of the injection hose and a further pot life determination performed.
- (e) During grouting material samples shall be taken on a frequency of at least one per hour of operation and the pot life recorded.
- (f) Deviation from the proportions and pot life specified shall result in immediate discontinuance of use of the material.
- (g) All records shall be submitted to the Contract Administrator at the end of each working day.

E26.7.8 Surface Finishing

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

E26.8 Quality Control and Assurance

E26.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E26.9 Measurement and Payment

- E26.9.1** Concrete crack injection will be measured on a length basis and paid for at the Contract Unit Price per lineal metre for "Concrete Crack Injection", 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. Included in this Specification, accepted and measured by the Contract Administrator.

E27. REMOVE EXISTING OVERHEAD SIGN STRUCTURES

E27.1 Description

- E27.1.1** This Specification shall cover all operations related to the removal, salvage and disposal of existing overhead sign structures as shown on the Drawings and as specified herein.
- E27.1.2** 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 Work as hereinafter specified.

E27.2 References

E27.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) CW 1130; clauses 3.6 and 3.7
- (b) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets
- (c) Specification E28, Traffic Management for Overhead Sign Support Structures Removal and Installation

E27.3 Scope of Work

E27.3.1 A detailed scope of all overhead sign structure work is listed in D3.2.3.

E27.3.2 The Work under this Specification shall include the following items or as otherwise directed by the Contract Administrator:

- (a) Removal and disposal of the following bridge-type sign support structures:
 - (i) S651 – SB Pembina Highway, South of Plaza Drive
 - (ii) S653 – NB Pembina Hwy, South of NB to WB Abinojii Mikanah Ramp
- (b) Removal and disposal of the following cantilever-type sign structures:
 - (i) S649 – NB Pembina Hwy, South of NB to EB Abinojii Mikanah Ramp
- (c) Removal and salvage of the following bridge-type sign support structures:
 - (i) S659 – NB Pembina Highway, North of Chancellor Drive
 - (ii) S650 – SB Pembina Highway, North of University Crescent
- (d) Removal and salvage of the following cantilever-type sign support structures:
 - (i) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
 - (ii) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp
- (e) Removal, dismantlement, salvage, and delivery of guide sign panels as described in D3.2.3 and E30.
- (f) Demolition of sign structure concrete foundations for the following bridge-type sign structures:
 - (i) S659 – NB Pembina Highway, North of Chancellor Drive
 - (ii) S653 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp
 - (iii) S651 – SB Pembina Highway, South of Plaza Drive
- (g) Demolition of sign structure concrete foundations for the following cantilever-type sign structures:
 - (i) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
 - (ii) S649 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
 - (iii) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp

E27.4 Submittals

E27.4.1 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.

E27.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E27.5 Materials

E27.5.1 General

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

E27.6 Equipment

- E27.6.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E27.7 Construction Methods

E27.7.1 General

- (a) The Contractor shall never lift an overhead sign structure or member over traffic.
- (b) The Contractor shall remove the existing sign support carefully without damaging the existing structure or adjacent property.
- (c) The Contractor shall place the salvaged overhead sign structure at an on-site location as accepted by the Contract Administrator.
- (d) All materials not identified for salvage shall be disposed of at an approved disposal facility by the Contractor. Any disposal fees shall be considered incidental to this Work.
- (e) Any damage to the structure or hardware that has not been identified prior to removal will be repaired or replaced by the City at the Contractor's expense.

E27.7.2 Demolition of Sign Structure Concrete Foundations

- (a) All sign structure concrete foundation piles identified in E27.3.2(f) and E27.3.2(g) are to be removed to 1.0m below grade.
- (b) All foundation voids shall be filled to grade with backfill, as approved by the Contract Administrator.
- (c) All foundation voids shall be seeded to match surrounding landscaping, as approved by the Contract Administrator.

E27.8 Measurement And Payment

- E27.8.1 Removal, salvage and disposal of existing overhead sign structures will be measured on a unit basis and paid for at the Contract Unit Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

Items of Work:

Removal, Salvage and Disposal of Existing Overhead Sign Support Structures:

- (a) S659 – NB Pembina Highway, North of Chancellor Drive
- (b) S653 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp
- (c) S651 – SB Pembina Highway, South of Plaza Drive
- (d) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
- (e) S649 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
- (f) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp
- (g) S650 – SB Pembina Highway, North of University Crescent

E28. TRAFFIC MANAGEMENT FOR OVERHEAD SIGN SUPPORT STRUCTURES REMOVAL AND INSTALLATION

E28.1 Description

- E28.1.1 This Specification shall cover all operations relating to the traffic management for overhead sign support structures removal and installation.
- E28.1.2 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 Work as hereinafter specified.
- E28.1.3 Further to clauses 3.6 and 3.7 of CW 1130-R3, the following shall apply for any overhead sign support structure works:
- (a) multiple lane closures, meaning the simultaneous closure of more than one (1) lane, shall be permitted as described herein, for the installation of overhead sign structures;
 - (b) multiple lane closures will not be permitted:
 - (i) 6:00 am to 8:00 pm Monday through Saturday, unless otherwise approved by the Contract Administrator.
 - (c) complete directional or full closures, for the purpose of installing the bridge-type steel overhead sign support structures shall be limited to a maximum of ten (10) minutes;
 - (d) the Contractor shall submit the online Regional Street Lane Closure Form at least three (3) Business Days prior to beginning Work on any particular street;
 - (e) pedestrian and ambulance/emergency vehicle access must be maintained at all times;
 - (f) flagperson(s) shall be used to affect temporary lane closures during the lifting of structures over open lanes. Flagperson(s) shall meet all applicable Manitoba Workplace Safety and Health regulations;
 - (g) all traffic control shall be implemented in accordance with the City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets.

E28.2 References

- E28.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
- (a) CW 1130; clauses 3.6 and 3.7
 - (b) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets

E28.3 Scope of Work

- E28.3.1 The Work under this Specification shall include the traffic management for overhead sign structure removal and installation.

E28.4 Submittals

- E28.4.1 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 or prior to the implementation of the lane closure(s), a detailed traffic management plan for each overhead sign structure location.
- E28.4.2 The detailed traffic management plans shall be prepared in accordance with the current edition of the City of Winnipeg's Manual of Temporary Traffic Control on City Streets.
- E28.4.3 The detailed traffic management plans shall:
- (a) show a plan view of the area for each stage of construction or traffic control setup;
 - (b) show all applicable signage and traffic management devices to be used;

- (c) provide all relevant dimensions and geometric layout of devices such as sign spacing, taper lengths, cone spacing, etc.;
- (d) indicate the general sequence of device installation;
- (e) indicate the date and time of implementation of the devices;
- (f) indicate the expected date and time of the removal of the devices;
- (g) confirm the work zones created by the closures are adequate for the operation of cranes, and other construction operations required for the work; and
- (h) all other information as deemed necessary by the Contract Administrator and/or other agencies reviewing the submitted traffic management plans.

E28.5 Materials

E28.5.1 General

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

E28.6 Equipment

E28.6.1 General

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

E28.7 Measurement and Payment

- E28.7.1 Traffic Management for Overhead Sign Support Structure Installation will be considered incidental to the Work in E31 and E27. No separate measurement or payment shall be made for the work associated with this Specification.

E29. REMOVAL AND SALVAGE OF TRAFFIC SIGNS

E29.1 Description

- E29.1.1 This Specification shall cover the removal and salvage of traffic signs.

E29.2 Materials

- E29.2.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- E29.2.2 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.

E29.3 Equipment

- E29.3.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E29.4 Construction Methods

E29.4.1 Removal and Salvage of Traffic Signs

- (a) The Contractor shall remove and salvage traffic signs as indicated on the Construction Drawings or as directed by the Contract Administrator.
- (b) The Contractor shall perform Removal and Salvage of Traffic Signs by a method acceptable to the Contract Administrator.

- (c) The Contractor shall utilize methods to remove, store, transport and salvage the existing signs (including supports and associated hardware) that do not damage the existing signs or adjacent works. The Contractor shall be responsible to repairing and replacing signs or adjacent works damaged by its removal operation; repairs and/or replacements shall be completed at the expense of the Contractor.
- (d) All signs, supports, and hardware shall be delivered to a City of Winnipeg Storage Yard as directed by the Contract Administrator. At the storage yard, the Contractor shall off-load the salvaged material with his own labour and equipment and place in the designated location indicated by City of Winnipeg Personnel and as directed by the Contract Administrator.

E29.5 Quality Control and Assurance

E29.5.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E29.5.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E29.6 Measurement and Payment

- E29.6.1 The Removal and Salvage of Traffic Signs will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E30. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS FOR STEEL OVERHEAD SIGN SUPPORT STRUCTURES

E30.1 Description

- E30.1.1 This Specification shall cover all operations relating to the drilling, reinforcing, and pouring of concrete pile foundations for steel overhead sign structures.
- E30.1.2 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 Work as hereinafter specified.

E30.2 References

E30.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets
- (b) CSA A23.1 – Concrete Materials and Methods of Concrete Construction

E30.3 Scope of Work

E30.3.1 The Work under this Specification shall include all concreting operations related to construction of cast-in-place concrete pile foundations for new steel overhead sign support structures in accordance with this Specification and as shown on the Drawings.

E30.3.2 A detailed scope of all overhead sign structure work is listed in D3.2.3.

E30.3.3 The Work under this Specification shall include the following items or as otherwise directed by the Contract Administrator:

- (a) New cast-in-place concrete pile foundations for the following bridge-style steel overhead sign structures:
 - (i) S659 – NB Pembina Highway, North of Chancellor Drive
 - (ii) S802 – EB to University Crescent Ramp
 - (iii) S804 – SB Pembina Highway, South of Plaza Dr
- (b) New cast-in-place concrete pile foundations for the following cantilever-style steel overhead sign structures:
 - (i) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
 - (ii) S803 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp
 - (iii) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp
- (c) Modifications to concrete pile foundation for the following steel overhead sign structure will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.:
 - (i) S650 – SB Pembina Highway, North of University Crescent, east foundation

E30.4 Submittals

E30.4.1 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.

E30.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E30.5 Materials

E30.5.1 General

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

E30.5.2 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 CSA Standard A23.1.

E30.5.3 Testing and Approval

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.

E30.5.4 Patching Mortar

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

E30.5.5 Cement

- (a) Cement shall be Type HS, HSe or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of the latest CSA Standard A23.1.

E30.5.6 Concrete

- (a) General
 - (i) Concrete repair material shall be compatible with the concrete substrate.
- (b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this Specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with the latest CSA A23.1:
 - (i) Class of Exposure: S-1 and F-1;
 - (ii) Compressive Strength @ 56 days = 35 MPa;
 - (iii) Water / Cementing Materials Ratio = 0.4;
 - (iv) Air Content: Category 1 per Table 4 of CSA A23.1-14 (5-8%);
 - (v) Cement – shall be as specified in E18.2.5.
- (c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.
- (d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for pile foundations
- (e) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.
- (f) The temperature of all types of concrete shall be between fifteen degrees Celsius (15°C) and twenty-five degrees Celsius (25°C) at discharge. Temperature requirements for concrete containing silica fume shall be between ten degrees Celsius (10°C) and eighteen degrees Celsius (18°C) at discharge unless otherwise approved by the Contract Administrator
- (g) Concrete materials susceptible to frost damage shall be protected from freezing.

E30.5.7 Aggregate

- (a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with the latest CSA A23.1.
- (b) Coarse Aggregate
 - (i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with the latest CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in the latest CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".
 - (ii) Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; and shall have an absorption not exceeding two and a quarter percent (2.25%).
 - (iii) 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, and excess of thin particles or any other extraneous material.
 - (iv) Coarse aggregate when tested for abrasion in accordance with the latest ASTM C131 shall not have a loss greater than thirty percent (30%).
 - (v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in the latest CSA A23.1, Table 12, for concrete exposed to freezing and thawing.
- (c) Fine Aggregate
 - (i) Fine aggregate shall meet the grading requirements of the latest CSA A23.1, Table 10, Gradation FA1.
 - (ii) Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.
 - (iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in the latest CSA A23.1, Table 12.

E30.5.8 Cementing Materials

- (a) Cementing materials shall conform to the requirements of the latest CSA A3001.

E30.5.9 Silica Fume

- (a) Should the Contractor choose to include silica fume in the concrete mix design, it shall not exceed eight percent (8%) by mass of cement.

E30.5.10 Fly Ash

- (a) Fly ash shall be Type C1 or Type F and shall not exceed twenty-five percent (25%) by mass of cement.

E30.5.11 Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening or formation of lumps shall not be used in the Work.

E30.5.12 Admixtures

- (a) Air entraining admixtures shall conform to the requirements of the latest ASTM C260.
- (b) Chemical admixtures shall conform to the requirements of the latest ASTM C494 or C1017 for flowing concrete.

- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators, and air-reducing agents will not be permitted, unless otherwise approved by the Contract Administrator.
- (d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.
- (e) An aminocarboxylate based migrating corrosion inhibitor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject to the approval of the Contract Administrator.

E30.5.13 Water

- (a) Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

E30.5.14 Concrete Supply

- (a) Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of the latest CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.
- (b) Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within (ninety) 90 minutes after the introduction of the mixing water to the cementing materials and aggregates.
- (c) The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E30.5.15 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of the latest CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars. All bars, including ties, shall be hot-dip galvanized in accordance with the latest ASTM A767 for a minimum net retention of 610 g/m². Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E30.5.16 Anchor Bolts, Nuts, and Washers

- (a) Anchor bolts, nuts, and washers shall be in accordance with the latest ASTM F1554 (Grade 55), and shall be hot-dip galvanized full length in accordance with the latest ASTM F2329 for a minimum net retention of 610 g/m², for the entire length of the anchor bolts. The top threaded portion of the anchor bolts shall be 300 mm long and the bottom threaded portion of the anchor bolts shall be 100 mm long. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E30.5.17 Anchor Bolt Templates

- (a) Anchor bolt templates shall be the latest CSA G40.21 Grade 300W, minimum 10 mm thick, and will be incidental to construction of new concrete pile foundation and no separate payment will be made.

E30.5.18 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.

E30.5.19 Precompressed Foam Joint Filler

- (a) Precompressed foam joint filler shall be "Emseal BEJS System", satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7.
- (b) The sealant system shall be comprised of three components:
 - (i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated and highway-grade, fuel resistant silicone;
 - (ii) Field-applied epoxy adhesive primer; and
 - (iii) Field-injected silicone sealant bands.
- (c) 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.
- (d) BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½" (12mm) down from the substrate surface.
- (e) Material shall be capable, as a dual deal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plan and direction shall be executed using factory fabricated transition assemblies. Transitions shall be watertight at the inside and outside corners through the full movement capabilities of the product.
- (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 (3) hours while compressed down to the minimum movement capability (-50% nominal material size) without evidence of any bleeding of impregnation medium from the materials; and
 - (ii) Capable of self-expanding to the maximum movement capability (+50% nominal material size) with twenty-four (24) hours at 20°C.

E30.5.20 Miscellaneous Materials

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

E30.6 Equipment

E30.6.1 General

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

E30.7 Construction Methods

E30.7.1 Location and Alignment of Piles

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

E30.7.2 Buried Utilities

- (a) The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible

for obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.

- (b) The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.
- (c) The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

E30.7.3 Excavation

- (a) Pile excavation shall be achieved by auguring (i.e. drilling) or hydro-jet excavation for the full depth of all piles unless noted otherwise on the Drawings.
- (b) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough "slack" in conduits to move them slightly to avoid interference with the pile locations. The Contract Administrator may elect to alter the location of a pile if hydro-jet excavation shows that utilities cannot be avoided.
- (c) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.
- (d) All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.
- (e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.
- (f) If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole excavated as near as possible to the location shown on the Drawings. In locations where underground utilities have been exposed, the underground utilities shall be covered with clean sand to 300 mm minimum cover around the utility. Payment will not be made for condemned piles.

E30.7.4 Sleeving

- (a) Steel or corrugated metal pipe sleeving shall be used if required to temporarily line the excavation to prevent bulging or caving of the walls.
- (b) The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.
- (c) The sleeving shall be withdrawn as the concrete is placed in the excavation. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.
- (d) The clearance between the face of the excavation and the sleeving shall not exceed 75 mm.
- (e) The sleeving may remain cast in place if required to protect nearby utilities at the direction of the Contract Administrator. The top of sleeving shall be 300 mm below the top of finished grade.

E30.7.5 Inspection of Excavations

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

E30.7.6 Placing Reinforcing Steel

- (a) Reinforcement shall be:
 - (i) placed in accordance with the details shown on the Drawings;
 - (ii) rigidly fastened together;
 - (iii) lowered into the excavation intact before concrete is placed.
- (b) Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E30.7.7 Placing Anchor Bolts

- (a) The anchor bolts shall be aligned with the steel templates matching the bolt holes in the sign structure base plate. The setting templates shall be held in place by the top and bottom nuts of the anchor bolts. The anchor bolts shall be plumb. Extreme care shall be used in this operation. Placement of anchor bolts without the steel template will not be permitted.
- (b) The threaded portion of the anchor bolts projecting above the top surface of pile shall be coated with oil, before the concrete is poured, to minimize the fouling of threads splattered by concrete residue.

E30.7.8 Forms

- (a) For hydro-jet excavated piles, the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 mm below final grade.
- (b) For bored piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 mm below final grade.
- (c) In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform. The minimum depth of the tubular forms (Sonotube) shall be as specified by E30.7.8(a) and E30.7.8(b).
- (d) The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.

E30.7.9 Placing Concrete

- (a) Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts and conduits are properly positioned prior to placement of concrete.
- (b) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile.
- (c) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be finished smooth with a hand float and provided with a one percent (1%) slope for drainage away from the centreline of the pile.
- (d) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator. In the event that tremie concrete is allowed by the Contract Administrator, the concrete shall be placed as specified herein.
- (e) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations 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 that may cause honeycombing, pitting, or planes of weakness.

E30.7.10 Tremie Concrete

- (a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface

of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

- (b) Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the excavation and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry excavation

E30.7.11 Protection of Newly Placed Concrete

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

E30.7.12 Curing Concrete

- (a) The top of the freshly finished concrete piles shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above ten degrees Celsius (10°C) for at least seven (7) consecutive days thereafter.
- (b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.
- (c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed three degrees Celsius (3° C) in one (1) hour or twenty degrees Celsius (20°C) in twenty-four (24) hours.

E30.7.13 Form Removal

- (a) Forms shall not be removed for a period of at least twenty-four (24) hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.
- (b) The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.
- (c) Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E30.7.14 Patching of Formed Surfaces

- (a) Immediately after forms around top of pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed.
- (b) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.
- (c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be well-brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one (1) hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E30.7.15 Cold Weather Concreting

- (a) Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above ten degrees Celsius

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

E30.7.16 Removal and Restoration of Adjacent Surface Treatments

- (a) If the new pile being constructed is located in a concrete sidewalk/median slab, the existing slab shall be removed to the nearest existing joints. If the nearest existing joint is more than 600 mm beyond the perimeter of the pile, the Contractor shall remove a square section of the existing slab that is 300 mm beyond the pile perimeter. The surface of the slab shall be saw-cut to a depth of 50 mm around the perimeter of the square section. Care shall be taken to ensure that the saw-cut edge of the section is not chipped or broken during the removal of the concrete. Concrete slabs damaged beyond the specified limits shall be replaced at the Contractor's cost to the satisfaction of the Contract Administrator. After the pile has been constructed, the concrete sidewalk/median slab shall be restored flush with the adjacent surface level.
- (b) If the pile being constructed is located in grass boulevard/median, following pile construction disturbed areas shall be backfilled and restored with sod around the new pile as directed by the Contract Administrator.
- (c) If the pile being constructed is located in a paving stone surface, the paving stones shall be temporarily removed to the extent required for new pile construction and appropriately stored by the Contractor. Following pile construction, the Contractor shall cut as required and re-set the salvaged paving stones around the new pile flush with the adjacent surface level, as directed by the Contract Administrator.
- (d) The removal and restoration of surface treatments will be considered incidental to pile construction works at each Site and no separate payment will be made.

E30.8 Quality Control and Assurance

E30.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E30.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E30.9 Measurement and Payment

E30.9.1 Construction of New Cast-in-Place Concrete Pile Foundations

- (a) Construction of new cast-in-place concrete pile foundations including supply and installation of anchor bolts complete with nuts, washers and steel templates will be measured on a lineal basis and paid for at the Contract Unit Price per meter for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.
- (b) Items of Work:
Cast-in-Place Concrete Pile Foundations:
 - (i) 915mm Diameter
 - (ii) 762mm Diameter
- (c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and the Drawings shall be considered incidental to "Cast-in-Place Concrete Pile Foundations", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E31. SUPPLY AND INSTALLATION OF SIGN SUPPORT STRUCTURES

E31.1 Description

- E31.1.1 The Work covered under this item shall include all operations related to the supply, fabrication, delivery, erection of new sign support structures, erection of salvaged structures and installation of new and salvaged sign panels onto the sign support structures.
- E31.1.2 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 the Work as hereinafter specified.

E31.2 References

- E31.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
 - (a) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets
 - (b) Specification E28, Traffic Management for Overhead Sign Support Structures Removal and Installation

E31.3 Scope of Work

- E31.3.1 A detailed scope of all overhead sign structure work is listed in D3.2.3.
- E31.3.2 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:
 - (a) The supply and installation of new steel overhead sign support structure (bridge-type):
 - (i) S802 – EB to University Crescent Ramp, including installation of new guide sign panels.
 - (ii) S804 – SB Pembina Highway, South of Plaza Drive, including installation of salvaged guide sign panels (from S651).

- (b) The supply and installation of new steel overhead sign support structure (cantilever-type):
 - (i) S803 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp, including installation of salvaged guide sign panel (from S653).
- (c) The supply and installation of new ground mount sign:
 - (i) GMGS – EB to University Crescent Ramp, including supply and installation of screw anchor piles (250mm diameter), aluminum posts and guide sign panel.
- (d) The installation of salvaged steel overhead sign support structure (bridge-type):
 - (i) S659 – NB Pembina Highway, North of Chancellor Drive, including installation of new reflective guide sign panels.
 - (ii) S650 – SB Pembina Highway, North of University Crescent, including installation of salvaged guide sign panels.
- (e) The installation of salvaged steel overhead sign support structure (cantilever-type):
 - (i) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp, including installation of salvaged guide sign panel.
 - (ii) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp, including installation of salvaged guide sign panel.

E31.3.3 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.

E31.3.4 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E31.4 Materials

E31.4.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) 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.
- (c) All materials used for fabrication of overhead sign support structures shall be new, previously unused material.

E31.4.2 Handling and Storage of Materials

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

E31.4.3 Structural Steel

- (a) Structural steel for all components of the overhead sign support structures shall be in accordance with CSA Standard G40.21 M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to three hundredths of a percent (0 to 0.03%) or fifteen hundredths to twenty-two hundredths of a percent (0.15 to 0.22%) for monotubular shafts and arms, and to less than three tenths of a percent (0.3%) for all other steel components.
- (b) The Contractor is advised that copies of mill test certificates showing the chemical and physical properties of all structural steel to be supplied under this Specification must be supplied to the Contract Administrator and be found acceptable prior to commencement of fabrication.

- (c) Steel shall not be acceptable unless the mill test certificate states the grade to be as indicated on the Drawings. Lower grade steel shall not be acceptable (despite favourable published mill test results). Items fabricated without steel certification shall be rejected.

E31.4.4 Flange Bolts, Nuts, and Washers

- (a) Flange bolts, nuts, and washers shall be in accordance with ASTM F3125 Grade A325, Type 1, hot-dip galvanized in accordance with ASTM F2329.

E31.4.5 Mounting Bracket Fasteners (Bracket-to-Bracket)

- (a) Mounting bracket fasteners (connecting two (2) clamp brackets) shall be all-thread rod conforming to one (1) of the following:
 - (i) SAE Grade 2 hot dip galvanized;
 - (ii) ASTM A307 Grade B hot dip galvanized;
 - (iii) ASTM F1554 Grade 55 hot dip galvanized.
- (b) Hot-dip galvanizing shall be in accordance with ASTM F2329. Plated coatings will not be accepted.
- (c) Two (2) nuts, two (2) washers and one (1) lock washer (all hot dip galvanized) shall be provided for each segment of threaded rod.
- (d) The Contractor is permitted to field cut the threaded rod to suit the required length. If so, apply Zinga zinc rich galvanizing touch up paint to cut ends.

E31.4.6 Mounting Bracket Fasteners (Bracket to Panel)

- (a) Mounting bracket fasteners connecting the bracket to the aluminum backing bars of the sign panel shall be stainless steel all-thread hex bolts conforming to ASTM F593 Grade 304 or 316.
- (b) One (1) nut, one (1) washer, and one (1) lock washer shall be furnished with each bolt.

E31.4.7 Fasteners for Handhole Covers

- (a) Fasteners for handhole covers shall be in accordance with ASTM A276 Type 316 stainless steel.

E31.4.8 Hot-Dip Galvanizing

- (a) Hot-dip galvanizing of structural steel shall be in accordance with ASTM A123 for a minimum net retention of 610 g/m².

E31.4.9 Galvanizing Touch-up and Field-Applied Galvanizing

- (a) Only approved products listed below shall be used for field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds.
- (b) Approved products for self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-09(2015) for "Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings" are as follows:
 - (i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California, available from Welder Supplies Limited, 150 McPhillips Street, Winnipeg;
 - (ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161, York Road, Kings Mountain, North Carolina, available from Welder Supplies Limited, 150 McPhillips Street, Winnipeg.

E31.4.10 Cold Applied Galvanizing Compound

- (a) Approved cold-applied galvanizing compound is as follows:
 - (i) ZINGA, as manufactured by ZINGAMETALL, Ghent, Belgium, available from Pacific Evergreen Industries Ltd. Vancouver, BC, Ph. (604) 926-5564, and Centennial Mine & Industrial Supply, Saskatoon, Sask., Ph. (306) 975-1944.

E31.4.11 Rodent Screen

- (a) Rodent screens shall be ½" – 18F stainless steel (316L) expanded metal sheet or approved equal in accordance with B.7.

E31.4.12 Cementitious Grout

- (a) Cementitious grout shall be nonshrink and nonmetallic. 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 B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E31.4.13 Aluminum T-Bars

- (a) Aluminum T-Bars shall be in accordance with ASTM B221 6061-T6.

E31.4.14 Sign Plates and Panels for Sign Structures

- (a) For sign support structures, guide sign panels are to be supplied by the Contractor in accordance with E32 and installed on the sign structures in accordance with this Specification.

E31.4.15 Welding Consumables

- (a) Welding consumables for all processes shall be certified by the manufacturer to be complying with the requirements of CSA Standard W59 and the following Specifications:
 - (i) manual shielded metal arc welding (SMAW): All electrodes shall be basic-type electrodes conforming to CSA W48, classification E480XX, or imperial equivalent;
 - (ii) gas metal arc welding (GMAW): All electrodes shall conform to CSA W48, classification ER480S-X, or imperial equivalent;
 - (iii) flux cored arc welding (FCAW): All electrodes shall conform to CSA W48, classification E480XT-X or imperial equivalent. Electrodes shall be controlled by hydrogen (CH) designation;
 - (iv) submerged arc welding (SAW): All electrodes shall conform to CSA W48, classification F480X-EXXX or imperial equivalent;
 - (v) shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of negative forty-six degrees Celsius (-46°C);
 - (vi) all electrodes, wires, and fluxes used shall be of a classification requiring a minimum impact of 27 joules at minus eighteen degrees Celsius (-18°C).
- (b) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for their approval at least two (2) Calendar Days prior to the scheduled commencement of any fabrication.

E31.4.16 Miscellaneous Materials

- (a) Miscellaneous material incidental to this Work shall be as approved by the Contract Administrator.

E31.5 Equipment

E31.5.1 General

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

E31.6 Construction Methods

E31.6.1 General

- (a) Holes in the base plates shall be sized as shown on the Drawings, and provisions made for field erection must be accurate within plus or minus 13 mm between supports, without affecting final installation and load capacity.

- (b) The base plates for the sign support structures shall be constructed to be fully compatible and mountable on the anchor bolts, provided in the foundations by the Contractor.
- (c) Sufficient reinforced handholes and wiring holes shall be provided for lighting of the signs as shown on the Drawings. All wiring holes shall have threaded couplings. All unused coupling holes shall be capped with a threaded galvanized plug.
- (d) The sign support structure shall be so fabricated that erection can be achieved by means of bolted connections.
- (e) Each sign structure shall be provided with a "raised" structure identification number with a welding electrode in accordance with the details shown on the Drawings. The sign structure identification number shall be placed before hot-dip galvanizing.
- (f) Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facilities shall be consulted regarding the size and location of these holes.
- (g) Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing the sign structures.

E31.6.2 Fabrication

- (a) All fabrication shall be carried out in accordance with this Specification and the Contract Drawings, as well as AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals - 2015 – 1st Edition, plus all subsequent revisions.
- (b) The punching of identification marks on the members will not be allowed, except for the structure identification number.
- (c) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may approve remedial measures.
- (d) Dimensions and fabrication details that control the field matching of parts shall receive very careful attention in order to avoid field adjustment.
- (e) All portions of the Work shall be neatly finished. Shearing, cutting, clipping, and machining shall be done neatly and accurately. Finished members shall be true to line, free from twists, bends, sharp corners, and edges.
- (f) Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.
- (g) All holes shall be free of burrs and rough edges.

E31.6.3 Welding

- (a) Welding of steel structures shall be in accordance with CSA W59, "Welded Steel Construction".
- (b) All seams shall be continuously welded and free from any slag and splatter. Longitudinal welds shall be a minimum of sixty percent (60%) penetration, except those within 200 mm of baseplates, flanges, and circumferential welds, which shall be one hundred percent (100%) penetration. All circumferential groove welds shall be one hundred (100%) penetration, and where circumferential welds are used at a butt joint, an internal backup strip shall be provided.
- (c) Longitudinal seam welds in horizontal supports shall be located at the top of the horizontal members.
- (d) All welds shall be ground smooth and flush with the adjacent surface prior to hot-dip galvanizing.

E31.6.4 Surface Preparation and Cleaning

- (a) Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A123 and SSPC Specification SP:6, "Commercial Blast Cleaning," unless otherwise specified herein. The Contractor shall ensure that all exterior and interior surfaces of vertical support members of sign structures are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 610 g/m^2 . All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.
- (b) The sandblasting and cleaning of sign structures shall be done in the shop.
- (c) After the structures have been sandblasted they shall be thoroughly cleaned of all sandblasting abrasive grit and debris, with special attention paid to areas of the structure where sand and debris collect, including but not limited to, behind the gusset plates, handholes and base plate.
- (d) After the sign structures have been sandblasted and cleaned, the Contract Administrator will carry out a visual inspection of the structures in the shop before they are shipped to the galvanizing plant.

E31.6.5 Hot-Dip Galvanizing

- (a) The hot-dip galvanizing plant shall be a Regular Member of the American Galvanizers Association, Inc.
- (b) All outside surfaces of the overhead sign support structures shall be hot-dip galvanized in accordance with ASTM A123 to a minimum net retention of 610 g/m^2 .
- (c) Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facility shall be consulted regarding the size and location of these holes. Holes shall be provided by drilling not burning.
- (d) The galvanizing coating on outside surfaces of overhead sign support structures shall be generally smooth and free of blisters, lumpiness and runs. In particular, the outside surfaces of the bottom 2.5 m of the vertical support members shall have a smooth finish equal to the finish on hot-dipped galvanized handrails.
- (e) In addition to the provision of corrosion protection by the galvanized coating, the aesthetic appearance of the structure after hot-dip galvanizing will also be a criterion in the acceptance or rejection of the galvanized coating. The galvanized coating on the entire structure shall have a uniform "silver" colour and lustre. Galvanizing with parts of the structure having dull grey coating or streaks or mottled appearance will not be acceptable. If the galvanizing is rejected for aesthetic reasons, the Contractor shall rectify the appearance by applying spray-on molten zinc metallizing with 85/15 zinc/aluminum alloy. The metallizing shall be carried out in the shop before the structure is installed.
- (f) Minor defects in the galvanizing coating shall be repaired as specified here below for "Field-Applied Touch-Up Galvanizing". The Contract Administrator shall be consulted before repairs are made.
- (g) Other defects and contaminants in the galvanizing coating, such as heavy dross protrusions, flux inclusions and ash inclusions shall be grounds for rejection of the galvanizing coating system.
- (h) The Contractor shall verify the thickness of galvanized coatings as part of their own quality control testing and make their results available to the Contract Administrator.
- (i) All threaded couplings shall be rethreaded after the sign structures have been hot-dip galvanized.
- (j) The sign structures shall be stored on timber blocking after hot-dip galvanizing.

E31.6.6 Delivery and Erection

- (a) The Contractor shall notify the Contract Administrator at least two (2) Business Days in advance of the anticipated delivery to the Site and erection of the overhead sign support structures.

- (b) The sign structures shall be lifted and secured with nylon ropes or other approved methods. Use of steel chains and steel hooks against hot-dip galvanized or powder coated surfaces will not be permitted. The structure components (shaft and arm etc.) shall be placed on timber blocking and secured with nylon ropes during their transportation to the Site.
- (c) Refer to E28 for Traffic Management requirements during erection.

E31.6.7 Attachment of Structure to Anchor Bolts

- (a) Each anchor bolt shall be provided with four (4) galvanized nuts: two (2) nuts at the bottom of the anchor bolt to secure the anchor bolt assembly template, one (1) nut below the base plate for levelling the structure, and one (1) nut above the base plate for anchoring the structure.
- (b) The anchor bolts shall have a minimum projection of 25 mm above the anchoring nuts.
- (c) The distance between the top of the concrete pile and the underside of the levelling nut shall not exceed one (1) anchor bolt diameter.
- (d) The threaded portions of the anchor bolts and nuts shall be treated with a wax based lubricant.
- (e) The Contractor shall plumb the shaft by adjusting the levelling and anchor nuts.
- (f) Levelling nuts and anchor nuts shall be tightened to a snug tight condition, defined as the full effort of an ironworker using an ordinary wrench, or a few impacts of an impact wrench.
- (g) The Contractor shall tighten the top anchoring nuts in an alternating "star" type pattern as follows:
 - (i) for anchor bolts less than or equal to 38 mm diameter: 1/3 of a turn (+20°, -0°) past a snug tight condition;
 - (ii) for anchor bolts greater than 38 mm diameter: 1/6 of a turn (+20°, -0°) past a snug tight condition.

E31.6.8 Structural Bolt Installation

- (a) Structural bolts for flange and splice connections shall be tightened in accordance with the turn-of-nut method as follows:
 - (i) alternately tighten all bolts to achieve a snug tight condition. The mating surfaces shall be in firm contact;
 - (ii) tighten all bolts in accordance with Table 1, below;
 - (iii) following tightening, check all bolts in the joint by hand using an ordinary wrench.

Table 1: Required Turns Past Snug Tight for Turn-of-Nut Method

Bolt Diameter <i>D</i> (inches)	Bolt Length up to 4 <i>D</i>		Bolt Length over 4 <i>D</i> to 8 <i>D</i>		Bolt Length over 8 <i>D</i> to 12 <i>D</i>	
	Length up to	Required Turns	Length Range	Required Turns	Length Range	Required Turns
1/2"	2"	1/3 ± 30°	2 to 4"	1/2 ± 30°	4 to 6"	2/3 ± 45°
5/8"	2.5"	1/3 ± 30°	2.5 to 5"	1/2 ± 30°	5 to 7.5"	2/3 ± 45°
3/4"	3"	1/3 ± 30°	3 to 6"	1/2 ± 30°	6 to 9"	2/3 ± 45°
7/8"	3.5"	1/3 ± 30°	3.5 to 7"	1/2 ± 30°	7 to 10.5"	2/3 ± 45°
1"	4"	1/3 ± 30°	4 to 8"	1/2 ± 30°	9 to 13.5"	2/3 ± 45°
1 1/8"	4.5"	1/3 ± 30°	4.5 to 9"	1/2 ± 30°	10 to 15"	2/3 ± 45°
1 1/4"	5"	1/3 ± 30°	5 to 10"	1/2 ± 30°	11 to 16.5"	2/3 ± 45°

E31.6.9 Installation of Sign Panels

- (a) The Contractor will be responsible for installation of new and salvaged sign panels on the sign support structures including loading and transport of salvaged sign panels from the City Yard.
- (b) The Contractor shall install the sign panels on the sign support structures immediately following erection of the support structures (same day). In no case will a sign support structure be allowed to be erected and left for a significant amount of time (greater than one (1) day) without having the sign panels installed.
- (c) Sign panels shall be installed such that the panels are level to ground after all support structure deflection has occurred.
- (d) Sign panels shall not be twisted or warped following installation.

E31.6.10 Rodent Screens

- (a) Rodent screens that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation shall be installed in lieu of grout pads at all overhead sign structure bases for all new sign support structures.
- (b) The entire gap shall be covered with an expanded stainless steel metal screen, in accordance with E49.5.11E31.4.11, "Rodent Screen". The bottom edge of the expanded stainless steel screen shall be in full contact with the surface of the concrete foundation. The top edge of the expanded stainless steel screen shall not extend beyond the top surface of the structure base plate.
- (c) The rodent screen shall be made of one (1) continuous piece of expanded stainless steel with only one (1) overlapping splice where the ends come together and lap a minimum of 75 mm.
- (d) The rodent screen shall be attached to the vertical side of the structure baseplate with self-tapping stainless steel screws (#8-1/2" long) complete with stainless steel washers. Pilot holes shall first be drilled into the baseplate to facilitate screw installation. Screws shall be installed at 200 mm on center maximum and at least one screw shall be installed through the overlapping splice to clamp the two (2) layers of rodent screen together.
- (e) The two (2) overlapping layers of rodent screen shall also be clamped just above the concrete foundation with a stainless steel fastener assembly consisting of a machine screw (#8-5/8" long) complete with a nut, two (2) flat washers and a lock washer. The rodent screen shall be tightly clamped between the flat washers.

E31.6.11 Grout Pads

- (a) Grout pads shall be installed at a thickness of 75 mm between the bottom of the base plate and the top of the concrete foundations at all overhead sign structure bases for all salvaged sign support structures.
- (b) Grout used for grout pads shall be in accordance with E31.4.12 "Cementitious Grout".

E31.6.12 Field-Applied Touch-up Galvanizing

- (a) Any areas of damaged galvanizing on the sign structures shall receive field-applied touch-up galvanizing.
- (b) Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose, scale, rust, paint, grease, dirt, or other contaminants.
- (c) For self-fluxing, low temperature, zinc based alloy rods, preheat the surface to three hundred and fifteen degrees Celsius (315°C) and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond four hundred degrees Celsius (400°C) and to not apply direct flame to the alloy rods.

- (d) For cold applied galvanizing compound, the approved product shall be applied by either a brush or roller. The compound shall be applied in three (3) coats, with each coat having a dry film thickness of 60 µm (2.36 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.

E31.7 Quality Control and Assurance

E31.7.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E31.7.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.
- (d) Welding Qualifications
 - (i) The Contractor shall produce evidence that the plant has recently been fully approved by the Canadian Welding Bureau (C.W.B.) to the requirements of CSA W47.1 Division 2.1 for welding of steel structures.
 - (ii) Approved welding procedures shall be submitted to the Contract Administrator prior to fabrication of any steel items.
- (e) Testing
 - (i) In addition to the Contractor's own quality control testing of all materials, welding procedures and steel fabrication including hot-dip galvanizing will be inspected and tested by the Contract Administrator to ascertain compliance with the Specifications and Drawings.
 - (ii) The Contract Administrator will hire a testing agency certified by the Canadian Welding Bureau to carry out shop fabrication inspection and testing before the overhead sign support structures are approved ready for installation of coating system. The inspector shall have access to all of the fabricator's normal quality control records for this Contract, specified herein. Inspection and testing will include:
 - ◆ visual inspection of one hundred percent (100%) of welds;
 - ◆ ultrasonic testing of one hundred percent (100%) of full penetration sections of longitudinal seam welds and circumferential butt welds;

- ◆ magnetic particle testing of a random ten percent (10%) of partial penetration sections of longitudinal seam welds;
 - ◆ ultrasonic testing of twenty-five percent (25%) of base plate and flange plate welds;
 - ◆ inspection of hot-dip galvanizing and coating thickness.
- (iii) Welds that are found by any of the inspection and testing methods to be inadequate and unsatisfactory shall be repaired in accordance with CSA W59 and then retested. The cost of the repairs and the cost of the retest shall be paid for by the Contractor.
- (iv) No repair shall be made until agreed to by the Contract Administrator.
- (v) Defects in hot-dip galvanizing shall be rectified as directed by the Contract Administrator.
- (f) Unacceptable Work
- (i) Any Work found to be unacceptable shall be corrected in accordance with CSA W59;
- (g) No repair shall be made until agreed to by the Contract Administrator.

E31.7.3 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E31.8 Measurement and Payment

E31.8.1 Supply and Installation of Sign Support Structures

- (a) Supply and installation of sign support structures will be measured on a unit basis per sign support structure supplied and installed, and paid for at the Contract Unit Price for "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

- (b) Items of Work:

Supply and Installation of Sign Support Structures:

- (i) S659 – NB Pembina Highway, North of Chancellor Drive
- (ii) S802 – EB to University Crescent Ramp
- (iii) GMGS – EB to University Crescent Ramp
- (iv) S648 – NB Pembina Highway, South of NB to EB Abinojii Mikanah Ramp
- (v) S803 – NB Pembina Highway, South of NB to WB Abinojii Mikanah Ramp
- (vi) S647 – SB Pembina Highway, North of SB to WB Abinojii Mikanah Ramp
- (vii) S650 – SB Pembina Highway, North of University Crescent
- (viii) S804 – SB Pembina Highway, South of Plaza Drive

E31.8.2 The installation of sign panels shall be considered incidental to the Work.

E32. SUPPLY OF REFLECTIVE GUIDE SIGN PANELS

E32.1 Description

E32.1.1 The Work covered under this item shall include all operations related to the supply of reflective guide sign panels..

E32.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E32.2 References

E32.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- (b) Manual of Uniform Traffic Control Devices for Canada (MUTCD)
- (c) ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
- (d) ASTM A320 Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
- (e) ASTM D4956 Standard Specification for Retroreflective Sheeting for Traffic Control

E32.3 Scope of Work

E32.3.1 The Work under this Specification shall include the supply of the following guide sign panels:

- (a) Supply of three (3) new guide signs for S659 – NB Pembina Highway, North of Chancellor Drive (bridge-type OHSS)
- (b) Supply of two (2) new guide signs for S804 – SB Pembina Highway, South of Plaza Drive (bridge-type OHSS)
- (c) Supply of one (1) new guide sign for GMGS – EB to University Crescent Ramp (ground mount sign)
- (d) Supply of one (1) new sign panel for S797 – NB University Crescent, approaching Pembina Highway
 - (i) Remove existing sign panel from structure; leave mounting clamps in place on the arm.
 - (ii) Supply and install three (3) new vertical aluminum T-bars, each 1' longer than existing T-bars.
 - (iii) Supply one (1) new 1' high aluminum sign panel substrate channel to match width of existing sign panel.
 - (iv) Remove white border from bottom of existing sign panel.
 - (v) Supply "EXIT ONLY" panel with black border on three sides.
 - (vi) Install new "EXIT ONLY" tab on existing sign panel; supply new clips/bolts as required to attach the new channel to the longer T-bars.
 - (vii) Drill new holes in the web of the three vertical T-bars that are 1' lower than the existing holes, such that when the modified sign is reinstalled, the minimum vertical clearance of 5.3 m is maintained.
 - ◆ Any required modifications to the sign panels to maintain the vertical clearance are the contractor's responsibility.
 - (viii) Reattach the sign panel to the mounting clamps using the existing hardware.

- (ix) The installation of S797 sign panel shall be considered incidental to the Work.

E32.3.2 Graphical content to be supplied by the Contract Administrator:

- (a) Acting on behalf of the City of Winnipeg, the Contract Administrator will supply the Contractor with the following information within fourteen (14) calendar days of the request by the Contractor:
 - (i) Electronic image file (PDF or JPEG) of the sign panel graphical content
 - (ii) Indication of character font, height, kern, line spacing, minimum edge distances, etc.
 - (iii) Indication of all colors for the sign panel content and background materials
 - (iv) Overall sign panel dimensions, with the sign panel height in increments of 305 mm.
 - (v) Number and spacing of vertical backing bars ("T-bars").
 - (vi) All dimensions will be shown in metric units

E32.4 Submittals

E32.4.1 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 sign panel fabrication work, Shop Drawings for each sign panel to be supplied.

E32.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E32.4.3 Shop Drawings shall conform to the following:

- (a) Submitted in electronically generated PDF format.
- (b) Be of natural scale (1 horizontal to 1 vertical).
- (c) Must be in full color. Scanned copies of printed materials will not be accepted.
- (d) Must be an accurate representation of the font, character size, spacing, edge distances, etc.
- (e) Show the spacing and edge distances of all vertical backing bars. For Contracts which include sign panel installation and/or installation of sign panels on new or existing structures, the location of the aluminum backing bars shown on the Shop Drawings shall take into consideration of potential conflicts with the mounting configuration on the structure, and shall be coordinated with respect to the shop drawings and/or as-built drawings of the sign panel support structure to which it will be mounted.
- (f) Must show at least one sign panel cross section taken vertically through the sign panel showing the aluminum substrate extrusion shape, profile, and connecting hardware information.
- (g) All dimensions shall be shown in metric units
- (h) Must include a statement of sign panel mass, in kilograms.

E32.4.4 Sheeting Product Data Sheet

- (a) Submit the product data sheet and manufacturer's recommendations for installation for the selected sheeting material(s) to the Contract Administrator at least ten (10) Business Days prior to commencement of work.

E32.4.5 Connecting Hardware

- (a) Submit samples of the connection hardware to the Contract Administrator at least ten (10) Business Calendar Days prior to commencement of work.

E32.5 Materials

E32.5.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) 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.
- (c) All material shall be new, previously unused. The re-use of sign panels after chemical stripping or sanding of the panel will not be accepted.

E32.5.2 Retro-reflective Sheeting

- (a) Highway sign retro reflective sheeting shall be fabricated using sign sheeting material, conforming to ASTM D4956 Standard Specification for Retro-reflective Sheeting for Traffic Control (latest edition) to Type XI, (full cube prismatic), encapsulated by a flexible transparent plastic film having a smooth outer surface.
- (b) Sheeting shall have a pre-coated adhesive backing protected by an easily removable liner and shall conform to ASTM D4956 Class 1; the adhesive backing shall be pressure-sensitive, require no heat, solvent, or other preparation for adhesion to smooth, clean surfaces.

E32.5.3 Retro-reflective Sheeting for Sign Panel Content

- (a) Sign panel content including lettering, line work, symbols etc. shall be fabricated from reflective sign sheeting material meeting the same requirements specified herein for the retro-reflective sheeting and securely affixed to the face of the sign panel.
- (b) The adhesive backing for the panel content shall be ASTM D4956 Class 1; the adhesive backing shall be pressure-sensitive, require no heat, solvent, or other preparation for adhesion to smooth, clean surfaces.

E32.5.4 Colors

- (a) All colors used shall conform to ASTM D4956 and as indicated on the graphical content information to be supplied by the Contract Administrator, and in general conformance with the Manual of Uniform Traffic Control Devices for Canada (MUTCD) latest edition.

E32.5.5 Substrate

- (a) Sign panel substrate shall consist of horizontally oriented and connected "channels" made from extruded aluminum alloy 6036-T6 conforming to Alcan die number 73247 or approved equal, with anodize treatment, each channel approximately 305 mm in exposed height.
- (b) Aluminum shall conform to ASTM B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

E32.5.6 Panel Clips and Bolts

- (a) Adjacent "channels" of substrate aluminum extrusions shall be connected with panel clips and bolts with geometry as shown on drawing TE-045H published by Manitoba Infrastructure and Transportation Traffic Engineering, as provided in Appendix 'D', or approved equal.
- (b) Clips shall conform to ASTM B221 alloy 6061-T6.
- (c) Clip bolts shall be 3/8" diameter x 3/4" long stainless steel conforming to ASTM A193 or A320, Grade 304 minimum, complete with a stainless steel locknut.
- (d) The head of the bolt shall be fabricated such that it slides into the substrate extrusion flanges while preventing rotation such that the nut can be tightened when connecting panel clips.

E32.5.7 Post Clips and Bolts

- (a) Substrate aluminum “channels” shall be connected to vertical backing bars (“T-bars”) using post clips and stainless steel bolts with geometry as shown on drawing TE-045i published by Manitoba Infrastructure and Transportation Traffic Engineering, as provided in Appendix ‘D’, or approved equal.
- (b) Post clips shall be fabricated from aluminum alloy 6356T.
- (c) Post clip bolts shall be 3/8” diameter x 1-3/4” long rectangular head T-bolts, from stainless steel conforming to ASTM A193 or A320, Grade 304 minimum, complete with a stainless steel washer and stainless steel locknut.
- (d) The rectangular head of the T-bolts shall be approximately 25 mm x 15 mm and fabricated such that it slides into the substrate extrusion flanges while preventing rotation such that the nut can be tightened when connecting post clips.

E32.5.8 Vertical Backing Bars (“T-Bars”)

- (a) Vertical backing bars (“T-Bars”) shall be of a type and grade as indicated on the Contract Drawings or as indicated elsewhere in the Contract Documents
 - (i) If not indicated on the contract drawings or specified elsewhere in the Contract Documents, vertical aluminum backing bars (“T-Bars”) shall be extruded aluminum T-sections conform to ASTM B221 Grade 6061-T6, and be 102 mm deep x 76 mm wide x 8 mm thick minimum.
- (b) Vertical backing bars (“T-Bars”) shall be supplied and installed on the back of the sign panel substrate in accordance with this specification.

E32.5.9 Sign Panel Mounting Brackets

- (a) For Contracts including sign panel installation on sign support structures using mounting brackets, the specifications for support structure mounting brackets and associated hardware shall be specified elsewhere.

E32.6 Equipment

E32.6.1 General

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

E32.7 Construction Methods

E32.7.1 General

- (a) Sign panels shall be fabricated in a controlled indoor shop-like environment.

E32.7.2 Substrate assembly

- (a) Edges of all substrate material shall be de-burred to provide a smooth finished edge.
- (b) All connecting hardware shall be firmly tightened and all surfaces firmly in contact, such that when connected the panel is rigidly and firmly fastened together into a single panel.
- (c) Panel clips and bolts shall be installed as follows:
 - (i) Connect adjacent aluminum substrate extrusions using panel clips, complete with 2 bolts per clip;
 - (ii) Horizontal spacing between connecting hardware sets shall be maximum 300 mm on centre, in a staggered fashion between rows of slots, except for the last slots at either end of the section or panel, at which locations a connecting hardware set shall be provided.
 - (iii) All nuts shall be tightened to a snug-tight condition, taking care not to over-tighten resulting in stripping of threads or failure of the lock nut.
- (d) Contractor shall ensure that all connection hardware supplied and installed as specified herein are compatible and when connected result in a rigid sign panel assembly.

E32.7.3 Sheeting

- (a) Sign panel sheeting material shall be correctly applied in accordance with the sheeting manufacturer's recommendations and industry accepted quality practices.
- (b) Prepare the sign panel substrate in accordance with the retro-reflective sheeting manufacturer's specifications prior to adhesion of the sheeting.
- (c) Retro-reflective sheeting shall be properly trimmed at either end of the panel so to be even with the end of the substrate.
- (d) No more than one (1) material seam per length of panel will be permitted. Excessive patching with off-cut reflective material patched together will not be accepted.
- (e) All material applied shall show no signs of wrinkles or improper adhesion to the viewed surface of the sign panel substrate.
- (f) Reflective material applied shall be completely edge curled vertically down both sides of the full length of the sign panel and the material shall show no signs of wrinkles or excessive bubbling on either sides of the edges of the panel after sheeting application.
- (g) Reflective material shall wrap over the vertical sides of the panel no more than 8 mm and should fit inside the groove edge provided in the aluminum extrusion, or terminated as otherwise recommended by the sheeting manufacturer.
- (h) The presence of tears, holes, scrapes, compressed cells or patches will be grounds of rejection.
- (i) Any joints must be sealed in accordance with the sheeting manufacturer's recommendations.

E32.7.4 Fabrication Tolerance

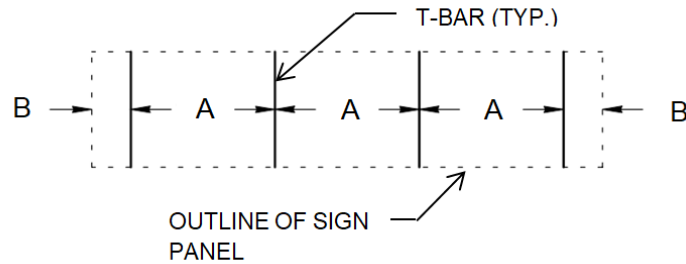
- (a) Dimensions of the overall sign panel (height and width) shall be fabricated to within 1% of the specified dimension.
- (b) Graphical content including character height, spacing, line spacing, and line weights shall not deviate from the specified dimension by more than 5%.
- (c) If present, deviations within the above noted tolerances shall be uniform. In the sole judgement of the Contract Administrator, noticeable deviations in the fabrication tolerance between individual graphical elements, even if they within the above specified limits, are grounds for sign panel rejection. For example, if the line weight of one particular letter on the sign panel was noticeably different than all other letters, the panel would be rejected.
- (d) The flatness of the sign panel shall be measured using a 3 m long straight edge placed flush to the front face of the sign panel in any direction. The maximum single deviation from the straight edge shall be no greater than 15 mm. Multiple deviations (i.e. waviness) in the panel shall be cause for rejection even if deviations are less than 15 mm.
- (e) Regardless of any measured deviation, no defect in the sign panel shall result in a reduction in the legibility of the sign, or the retro-reflective performance of the panel. The Contract Administrator shall be the sole judge as to whether a defect is present and if it requires repair or replacement of the sign panel.

E32.7.5 Manufacturer's Identification

- (a) All signs shall be clearly and permanently labeled using durable weather resistant material or engraving with an identification coding. The coding shall appear in characters 6-10 mm high on the lower right back of the sign and shall be imparted in such a manner that the front face of the sign is not damaged. The manufacturer shall include the following information on the label:
 - (i) Manufacturer's name
 - (ii) Month and year of manufacture, in MM-YYYY format.
 - (iii) Brand of sign sheeting material

E32.7.6 Connecting Vertical Backing Bars ("T-bars")

- (a) Vertical backing bars ("T-bars") shall be installed on the back of the sign panel substrate square to the sign panel, extend the full height of the sign panel, and in accordance with the spacing shown on the Contract Drawings.
- (b) Where no Contract Drawings are applicable, or if the spacing is not indicated, vertical backing bars shall be installed on that back of the sign panel substrate as indicated in the following table, or as directed by the Contract Administrator:



Typical Sign Width	Number of Vertical Backing Bars	Dimension A [# spaces] x [mm]	Dimension B [mm]
7320 mm (24 ft)	6	5 x 1220	610
6710 mm (22 ft)	5	4 x 1425	505
6100 mm (20 ft)	5	4 x 1225	600
5490 mm (18 ft)	4	3 x 1430	600
4880 mm (16 ft)	4	3 x 1220	610
4270 mm (14 ft)	4	3 x 1200	335
3660 mm (12 ft)	3	2 x 1400	430
3050 mm (10 ft)	3	2 x 1200	325
2440 mm (8 ft)	2	1 x 1000	720

- (c) No holes shall be drilled in the backing bars at the time of fabrication. If required, holes in the backing bars shall only be field drilled at the time of final installation on the support structure to ensure a level and planar sign panel when mounted to the support structure.
- (d) A post clip and bolt shall be provided to connect each side of each vertical backing bar ("T-bar") to the flanges of the aluminum substrate extrusion. The maximum spacing of the post clips and bolts shall be 305 mm and they shall be provided on alternating sides of the vertical backing bar,
 - (i) In addition, the top and bottom of the vertical backing bar shall be fitted with a post clip and bolt on both sides of the backing bar.
- (e) All nuts shall be tightened to a snug-tight condition, taking care not to over-tighten resulting in stripping of threads or failure of the lock nuts or washers.

E32.7.7 Packaging and Delivery

- (a) Contractor shall package each preassembled sign panel individually prior to delivery. Packaging shall protect the sign panel from damage to the sheeting or aluminum components and hardware.

- (b) Contractor shall be responsible for safe handling, lifting, hauling, transporting and offloading of sign panels.
- (c) Sign panels shall be protected from damaging effects including scratches, warping, and denting which may be caused during handling.
- (d) For Contracts that do not include installation of the sign panel and are for supply and delivery only, the Contractor shall offload the sign panels at the stated delivery location, and place the sign panel(s) in a location directed by the Contract Administrator or designate.

E32.7.8 Delivery

- (a) For Contracts that include sign panel installation, sign panels shall be delivered to the work site under the care of the Contractor. Sign panels shall be appropriately protected and stored on site or in a suitable location until final installation occurs.
- (b) Damaged sign panels shall be repaired or replaced to the satisfaction of the Contract Administrator at no additional cost to the City of Winnipeg.

E32.8 Quality Control and Assurance

E32.8.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E32.8.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E32.8.3 Field Performance Requirements

- (a) Reflective sheeting, processed and applied according to the sheeting manufacturer's recommendations (or as specified in this specification when there is an exception to the manufacturer's recommendations), shall perform satisfactorily for the number of years required under Warranty as stated in this Specification.
- (b) The sheeting (including all sign panel content) shall be considered unsatisfactory if it has deteriorated due to natural causes (precluding unnatural causes such as vehicle impact or vandalism), to the extent that the sign is ineffective for its intended purpose, when viewed from a moving vehicle under normal day and night driving conditions or shows any of the following defects:

- (i) Cracks discernible with the unaided eye from the driver's position while in an outside lane at a distance of 15 meters (50 feet) or greater from the sign
- (ii) Peeling in excess of 6.4 millimeters (1/4 inch)
- (iii) Shrinkage in excess of 3.2 millimeters (1/8 inch) total per 1.2 meters (48 inches) of sheeting width
- (iv) Fading or loss of color to the extent that color fails to meet the requirements in ASTM D4956.
- (v) Loss of reflectivity to a level below 20% of the minimum values specified in ASTM D4956 or in this specification for new sheeting when measured at the angles specified for each type.

E32.8.4 Warranty

- (a) Before final acceptance of the sign panel(s) by the Contract Administrator, the sign panel Supplier shall provide the Contract Administrator with a written warranty stating that they will perform satisfactorily in the field for a period of twelve (12) years from the issuance of the Certificate of Total Performance. The Supplier shall state that they have reviewed the fabrication and installation procedures and find them in accordance with their recommendations.
 - (i) The Supplier shall warranty the replacement of the entire sign panel, including removal of the existing panel and installation of replacement panel in the field, at no cost to the City of Winnipeg or the Contractor, in the event that the sign panel(s) do not meet the field performance requirements specified in E32.8.3 for a period of seven (7) years from the issuance of the Certificate of Total Performance.
 - (ii) The Supplier shall warranty the replacement of the sheeting material only, including panel removal and reinstallation in the field, at no cost to the City of Winnipeg or the Contractor, in the event that the sign panel(s) do not meet the field performance requirements specified in E32.8.3 during the period of eight (8) to twelve (12) years from the issuance of the Certificate of Total Performance.

E32.9 Measurement and Payment

E32.9.1 Supply of Sign Panels

- (a) Supply of Sign Panels will not be measured. The Supply of Sign Panels will be paid for at the Contract Lump Sum Price for "Supply of Sign Panels", which shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.

E33. SUPPLY AND INSTALLATION OF CRASH CUSHIONS

E33.1 Description

- E33.1.1 The Work covered under this Specification shall include all operations related to the supply, fabrication, delivery and installation of the crash cushions and associated materials in accordance with AASHTO MASH or NCHRP Report 350.
- E33.1.2 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 the Work as hereinafter specified. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.
- E33.1.3 Site specific requirements for the installation of crash cushions will be in accordance with the Drawings. General supply, loading, hauling, unloading, storing and installing is as per Manufacturer's recommended procedures.

E33.1.4 The Contractor shall provide manufacturers product data sheet and shop drawings prior to supply and installation. The shop drawings will be subject to acceptance by the Contract administrator.

E33.2 Materials

E33.2.1 Crash Cushions

- (a) Materials shall be supplied in accordance with the manufacturer's product manual and in accordance with AASHTO MASH or NCHRP Report 350.
- (b) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this specification.
- (c) The following products will be supplied by the Contractor:
 - (i) Two (2) Quadguard Test Level 2 (QS3603PY) with tension strut backup and associated hardware by Valtir, LLC for permanent installation.
 - (ii) Two (2) Absorb-M Test Level 2 and associated hardware by Lindsay Transportation Solutions for temporary installation.
- (d) The Contractor may request an approved equal for the item listed in (c) in accordance with B7.
- (e) Concrete and reinforcing steel shall be supplied in accordance with the Drawings and CW 3310.
- (f) Granular levelling materials shall be Base Course in accordance with CW 3110.

E33.2.2 Anti-freeze Solutions

- (a) Anti-freeze agent and concentrations shall be supplied and installed in the Absorb-M as per the Manufacturer's recommendations to account for operating temperatures expected during the installation period (ie. winter). Water filled Absorb-M Elements shall not be allowed to freeze.

E33.3 Construction Methods

E33.3.1 Handling and Storage of Materials

- (a) All materials shall be handled in a careful and workmanlike manner and the sections and ends shall be stored on blocks or built-up platforms.
- (b) Bolts and malleable washers shall be stored separately in suitable bins for inspection, checking and handling.

E33.3.2 Site Inspection

- (a) Prior to commencing installation at a location, the Contractor shall verify that it can be installed in strict accordance with the Drawings. This shall include contacting all utilities and other owners of underground facilities in order to ensure that the proposed location of the posts is not in conflict with existing or proposed utilities and installations.
- (b) Should there be a conflict between a proposed location and any facility the Contract Administrator shall be notified immediately.

E33.3.3 The crash cushions shall be installed in accordance with the manufacturer's installation manual.

- (a) Refer to:
 - (i) Quadguard Product Description and Assembly Manual, see Appendix 'C';
 - (ii) Absorb-M Installation Manual, see Appendix 'C'.

E33.3.4 Related items, including concrete foundations and backups, reinforcing steel, connection hardware, excavation, granular levelling materials, compaction, and anti-freeze agents are to be installed as shown on the Drawings or as per the manufacturer's recommendations.

E33.4 Measurement and Payment

E33.4.1 Installation of Quadguard Crash Cushion c/w Concrete Pad

- (a) Supply and Installation of Quadguard Crash Cushion, including all product materials, concrete foundations, reinforcing steel, connection hardware, excavation, granular levelling materials and compaction will be measured for payment on a unit basis and paid for at the Contract Unit Price for "Supply and Installation of Quadguard Crash Cushion c/w Concrete Pad".

E33.4.2 Supply, Installation and Removal of Absorb-M Crash Cushion

- (a) Supply, installation and removal of Absorb-M Crash Cushion, including all product materials, anti-freeze agents and connection hardware will be measured for payment on a unit basis and paid for at the Contract Unit Price for "Supply, Installation and Removal of Absorb-M Crash Cushion. Payment will be made on the following schedule:
 - (i) 75% payment of the Contract Unit Price will be paid upon supply and installation.
 - (ii) 25% payment of the Contract Unit Price will be paid once removed from Site and any necessary site cleanup has been completed.

ROADWORKS

E34. PORTLAND CEMENT CONCRETE SIDEWALK WITH BLOCK OUTS FOR INDICATOR SURFACES

E34.1 Description

E34.1.1 This specification shall supplement CW 3325-R5 "Portland Cement Concrete Sidewalks".

E34.2 Construction Methods

E34.2.1 Add the following to section 9:

- (a) As shown on the drawings and as directed by the Contract Administrator, construct sidewalk with block outs and/or monolithic curb and sidewalk with block outs, to allow for the installation of indicator surfaces.
- (b) Verify dimensions of paving stones (indicator surface) prior to construction of the block-outs. Gaps between paving stones and concrete pavement shall not exceed five (5) millimetres.
- (c) Concrete curbs for monolithic curb and sidewalk with block outs shall be constructed in accordance with CW 3240.

E34.3 Measurement and Payment

E34.3.1 Add the following to section 12:

- (a) Construction of concrete sidewalks with block outs for indicator surfaces will be measured on surface area basis. The surface area to be paid for shall be the number of square metres constructed in accordance with this specification and accepted by the Contract Administrator, as computed by measurements made by the Contract Administrator.

E34.3.2 Add the following to section 13:

- (a) Construction of concrete sidewalks with block outs for indicator surfaces will be paid for at the Contract Unit Price per square meter for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this specification.
- (b) Items of Work:
 - (i) 100 mm Sidewalk with Block Outs

- (c) Concrete thickness greater than the specified sidewalk thickness as a result of shaping the base material to accommodate the block outs is incidental to the listed Items of Work.

E35. PAVING STONES FOR INDICATOR SURFACES

E35.1 Description

- E35.1.1 This specification shall supplement CW 3330-R5 "Installation of Interlocking Paving Stones".

E35.2 Materials

- E35.2.1 Add the following to section 5:
 - (a) Paving Stones for indicator surfaces shall be as shown on the drawings.
 - (b) Paving Stones for indicator surfaces shall be:
Barkman Concrete paving stones -
Charcoal Holland Paver (60mm X 210 mm X 210 mm)
<https://www.barkmanconcrete.com/>
 - (c) Paving Stones for bus stops shall be:
Barkman Concrete paving stones -
Blue Holland Stone (105mm X 320 mm X 60 mm)
<https://www.barkmanconcrete.com/>

E35.3 Construction Methods

- E35.3.1 Add the following to section 9.2 "Preparation of Sub-grade, Sub-base and Sand-base":
 - (a) Preparation of Sand-Base for Paving Stones in Sidewalk Block Outs.
 - (b) Place a 15 mm layer of bedding sand in the blocked-out sidewalk areas.
 - (c) The bedding sand shall be spread and levelled so that the paving stones when installed are at the finished grade.
 - (d) No more sand shall be spread than can be covered in with paving stone on the same day.
 - (e) The bedding sand shall not be compacted or disturbed prior to laying the paving stones.
- E35.3.2 Add the following to section 9.3 "Installation of Paving Stones":
 - (a) For indicator surface paving stones, commence installation of paving stones against the long edge of the block out to obtain the straightest possible course of installation.

E35.4 Measurement and Payment

- E35.4.1 Add the following to section 12:
 - (a) Supply and Installation of Paving Stones for Indicator Surfaces:
 - (i) Paving stones for indicator surfaces will be measured on surface area basis. The surface area to be paid for shall be the number of square metres constructed in accordance with this specification and accepted by the Contract Administrator, as computed by measurements made by the contract Administrator.
- E35.4.2 Add the following to section 13:
 - (a) The supply and installation of paving stones for indicator surfaces will be paid for at the Contract Unit Price per square meter for "Paving Stone Indicator Surface", measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this specification.

- (b) Concrete thickness greater than the specified sidewalk thickness as a result of shaping the base material to accommodate the block outs is incidental to the listed Items of Work.

E36. MISCELLANEOUS CONCRETE WORKS (ROADWORKS)

E36.1 Description

- E36.1.1 This Specification shall supplement and amend CW 3310-R18 – “Portland Cement Concrete Pavement Works”.
- E36.1.2 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 an incidental to the satisfactory performance and completion of all work hereinafter specified.

E36.2 Materials

E36.2.1 General

- (a) All materials shall be as specified in CW 3310-R18.
- (b) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) All 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.

E36.3 Equipment

E36.3.1 General

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

E36.4 Construction Methods

E36.4.1 Single Slope Barriers

- (a) Double-sided single slope barriers shall be constructed to the dimensions and at the locations shown on the Drawings.
- (b) Reinforcing steel shall be installed as per the Drawings or as directed by the Contract Administrator.

E36.4.2 Concrete Curb Transitions

- (a) Transition sections of concrete barriers and curbs shall be constructed to the dimensions and at the locations shown on the Drawings or as directed by the Contract Administrator.

E36.4.3 Monolithic Curb and Sidewalk for Asphalt Cycle Track

- (a) The Contractor shall construct the monolithic curb and sidewalk for asphalt cycle track to the dimensions and at the locations shown on the Drawings and in general conformance with CW 3310 for other types of monolithic curb and sidewalk.
- (b) The Contractor shall utilize slip-form paving methods wherever possible, as determined by the Contract Administrator.

E36.4.4 Concrete Curbs

- (a) Concrete curbs shall be constructed to the dimensions and at the locations shown on the Drawings or as directed by the Contract Administrator.

E36.5 Quality Control and Assurance

E36.5.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the 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.

E36.5.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E36.6 Measurement and Payment

E36.6.1 Single Slope Barriers

- (a) Single slope barriers will be measured on a length basis and paid for at the Contract Unit Price for the "Items of Work" listed here below. The length to be paid for will be the total number of meters installed in accordance with this Specification, accepted and measured by the Contract Administrator.
- (b) **Items of Work** - Construction of Single Slope Barrier
 - (i) Double-Sided
- (c) Supply and installation of reinforcing steel shall not be measured and shall be considered incidental to "Construction of Single Slope Barrier".

E36.6.2 Concrete Curb Transitions

- (a) Concrete Curb Transitions will be measured on a length basis and paid for at the Contract Unit Price for the "Items of Work" listed here below. The length to be paid for will be the total number of meters installed in accordance with this Specification, accepted and measured by the Contract Administrator.
Items of Work - Construction of Concrete Curb Transitions
 - (i) Single Slope Barrier to Safety Curb
 - (ii) Single Slope Barrier to Mountable Curb
 - (iii) Barrier Curb to Safety Curb

E36.6.3 Monolithic Curb and Sidewalk for Asphalt Cycle Track

- (a) Monolithic curb and sidewalk for asphalt cycle track will be measured on a length basis and paid for at the Contract Unit Price for "Monolithic Curb and Sidewalk for Asphalt Cycle Track". The length to be paid for will be the total number of meters

installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E36.6.4 Concrete Curbs

- (a) Concrete Curbs will be measured on a length basis and paid for at the Contract Unit Price for the "Items of Work" listed here below. The length to be paid for will be the total number of meters installed in accordance with this Specification, accepted and measured by the Contract Administrator.

Items of Work - Construction of Concrete Curbs

- (i) 120 mm Mountable Curb for Asphalt Overlay
- (ii) 150 mm Barrier Curb for Asphalt Pavement

E37. CONSTRUCTION OF TINTED CONCRETE

E37.1 Description

E37.1.1 This Specification shall cover all operations relating to the construction of "red" tinted concrete pavement, intended to delineate Transit only lanes on this project.

- (a) The tinted concrete is finished at grade and is the width of the travel lane.
- (b) Care must be taken with consistency in water/cement ratio and finishing as the color can be affected load to load.

E37.1.2 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 Work as hereinafter specified.

E37.2 References:

E37.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) CW 3310- Portland Cement Concrete Pavement Works;

E37.3 Materials

E37.3.1 Concrete Materials

- (a) The Contractor shall base the tinted concrete mix on a mix design that has been approved for the 2025 construction season by the City of Winnipeg Research and Standards Department.
- (b) The base mix design shall conform to CW 3310 with the following alterations:
 - (i) Type 1 mix; and
 - (ii) Slump for hand placement shall be 80 mm +/- 20 mm prior to adding superplasticizers (if needed) to facilitate finishing without adding water to the surface.
- (c) Alterations to the base mix design will be considered by the Contract Administrator if necessary to account for the concrete tint material and finishing operations.

E37.3.2 Concrete Tint

- (a) "Red" coloured metal oxide pigment used to permanently color ready-mix concrete.
- (b) Approved Product List
 - (i) Lafarge Red (Premium) supplied through L.M. Scofield Company;
 - (ii) SG160-2 Sunrise Red supplied through L.M. Scofield Company;
 - (iii) RG-2827R Baja Red (1 bag) supplied through Interstar;
 - (iv) Baja Red supplied through Davis Colors.

- (c) Contractor to cast one coloured concrete sample minimum 200 mm x 200 mm in area using base concrete mix for approval by Contract Administrator.
- (d) Tinted concrete shall not be placed until sample color has been accepted by the Contract Administrator. The Contractor shall demonstrate that the sample will achieve the approximate color advertised by the pigment supplier using local concrete mix materials.

E37.3.3 Superplasticizers

- (a) Superplasticizers shall conform to the requirements of CSA CAN3-A266.5 and CAN3-A266.6, but must be compatible with the air-entraining agent. The agent shall be free of chlorides and shall not affect the air-entraining agent's ability to produce a satisfactory air void system.

E37.3.4 Liquid Membrane-Forming Curing Compound

- (a) Curing Compound shall be clear (no pigment), and water based conforming to the requirements of ASTM C309.

E37.4 Equipment

E37.4.1 General

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

E37.4.2 Floating and Finishing Equipment

- (a) Use only wood or magnesium floats. Bull floats used for initial finishing shall be constructed of wood only.

E37.5 Construction Methods

E37.5.1 Concrete formwork, steel reinforcement, placement, curing, and joint sealing as per CW 3310 except as modified in the following clauses.

E37.5.2 As shown on the drawings, construct formed 50 mm headers to define the lane edge and transverse termination of at-grade coloured concrete where the adjacent pavement is to be asphalt overlaid.

E37.5.3 Clean finishing tools and equipment and let dry prior to finishing. Wet tools will fade the colouring. Wetting of tools during finishing operation is not permitted.

E37.5.4 Place concrete at a consistent slump. No water shall be added on Site. Superplasticizer may be added at a rate suggested by the concrete supplier if additional workability is needed.

E37.5.5 No localized water spray or fogging is permitted to assist in finishing as this will locally fade the colour.

E37.5.6 Clear curing compound only shall be used. The use of water curing or plastic film is not allowed. Plastic film for insulation in cold weather must be approved by the Contract Administrator.

E37.6 Measurement and Payment

E37.6.1 Construction of Tinted Concrete

- (a) Construction of Tinted Concrete will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Construction of 230 mm Type 1 Concrete Pavement (Plain Dowelled, Tinted)". The area to be paid for will be the total number of square meters of tinted concrete supplied and placed in accordance with this Specification and accepted by the Contract Administrator

E38. CATCH BASINS AND CATCHPITS

E38.1 Description

E38.1.1 This Specification shall amend CW 2130-R12.

E38.2 Materials

E38.2.1 Inlet Frame and Grated Covers

- (a) Inlet frame and grated covers, where shown on the Drawings as such, shall be Titan Foundry, TF-100 or approved equal.
- (b) Frame and grated covers (TF-100) shall conform to all applicable City of Winnipeg Standard Construction Specifications, specifically the City of Winnipeg Standard for Gray and Ductile Iron Municipal Castings.
- (c) All gray iron shall conform to the requirements of ASTM A48, Class 30 with a minimum Ultimate Tensile Strength (UTS) of 206.8427 MPa (30,000 p.s.i.). All gray iron shall meet the applicable quality-assurance test requirements of ASTM A48 with regard to material, workmanship and minimum design load.
- (d) Basic materials shall be made from virgin or recycled and meets the physical and chemical properties as defined in ASTM A48 for Class 30 gray iron.

E38.3 Construction Methods

E38.3.1 Inlet Frame and Grated Covers

- (a) Catch basins (SD-024, SD-025) and catch pits (SD-023) requiring frame and grated covers (TF-100) will be labelled on the Drawings. The Contractor shall install the TF-100 instead of the frames and covers shown on the Standard Details.

E38.4 Measurement and Payment

E38.4.1 There shall be no measurement or payment made for the items in this Specification. They shall be considered incidental to the installation of catch basins or catch pits.

E39. HYDRANT RELOCATION

E39.1 Description

E39.1.1 This Specification amends CW 2110-R11, Watermains.

E39.2 Construction Methods

E39.2.1 Hydrant Relocation - Type A

- (a) CW 2110-R11, Section 3.21.3.1.2 shall be replaced with "Install a new hydrant (SD-006) in accordance with Section 3.8 at the location shown on the Drawings or as directed by the Contract Administrator."
- (b) Type A hydrant relocation shall include the installation of a watermain valve in accordance with Section 3.9.

E39.2.2 Hydrant Relocation - Type B

- (a) CW 2110-R13, Section 3.21.3.2 shall be replaced with "Install a new hydrant (SD-007) in accordance with Section 3.8 at the location shown on the Drawings or as directed by the Contract Administrator."
- (b) Type B hydrant relocation shall include the installation of a watermain valve in accordance with Section 3.9.

E39.3 Measurement and Payment

E39.3.1 Hydrant Relocation - Type A

- (a) Relocating hydrants will be measured on a unit basis and paid for at the Contract Unit Price for "Relocating Existing Hydrant - Type A (including new hydrant and valve)". Number of units to be paid for will be the total number of hydrants relocated in accordance with this Specification, accepted and measured by the Contract Administrator.
- (b) The following will be included in the price paid for "Relocating Existing Hydrant- Type A (including new hydrant and valve)":
 - (i) Disposal of existing hydrant;
 - (ii) Supply and installation of new hydrant (SD-006);
 - (iii) Supply and installation of new valve;
 - (iv) Up to 3.0 metres of new hydrant lead pipe measured from the connection to the existing hydrant lead.

E39.3.2 Hydrant Relocation - Type B

- (a) Relocating hydrants will be measured on a unit basis and paid for at the Contract Unit Price for "Relocating Existing Hydrant - Type B (including new hydrant and valve)". Number of units to be paid for will be the total number of hydrants relocated in accordance with this Specification, accepted and measured by the Contract Administrator.
- (b) The following will be included in the price paid for "Relocating Existing Hydrant- Type B (including new hydrant and valve)":
 - (i) Disposal of existing hydrant;
 - (ii) Abandonment/removal of existing tee;
 - (iii) Supply and installation of new hydrant (SD-007);
 - (iv) Supply and installation of new valve;
 - (v) Up to 3.0 metres of new hydrant lead pipe measured from the connection to the existing hydrant lead.

E40. MANITOBA HYDRO GAS INFORMATION

E40.1 Description

- E40.1.1 This Specification shall provide additional information regarding working around Manitoba Hydro gas infrastructure.
- E40.1.2 While working in close proximity to Manitoba Hydro gas infrastructure, all procedures and precautions outlined in Appendix 'C' as well as any supplemental direction from Manitoba Hydro must be adhered to. Ensure that all locates and clearances are current and have been received and understood prior to construction.

E40.2 Measurement and Payment

- E40.2.1 Manitoba Hydro gas information will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E41. ADJUSTMENT OF EXISTING MANITOBA HYDRO MANHOLES

E41.1 Description

- (a) This Specification shall cover the adjustment of existing Manitoba Hydro manholes.

E41.2 Materials

- (a) All frames, covers and cast iron lifter rings shall be supplied by Manitoba Hydro.
- (b) All concrete, and miscellaneous material shall be supplied by the Contractor in accordance with CW 3210.

E41.3 Construction Methods

(a) Responsibility of the Contractor

- (i) Upon commencement of the Work, it shall be the responsibility of the Contractor to ensure that no materials are damaged as a result of his construction activities. Materials found damaged, missing or lost after the commencement of the Work shall be replaced or repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator and Manitoba Hydro.
- (ii) The Contractor shall be responsible for coordinating his work with Manitoba Hydro safety watch or inspection crews.

(b) Adjustment of Existing Manitoba Hydro Manholes

- (i) Adjust existing Manitoba Hydro manhole frames at locations shown on the Drawings or as directed by the Contract Administrator.
- (ii) Contractor to remove pavement without damaging the existing frame or roof/structure.
- (iii) Prevent construction material and debris from entering the manhole.
- (iv) Remove existing grout and bricks without damaging precast concrete riser sections or flat top reducers.
- (v) Set frame to finished grade with bricks or as approved by the Contract Administrator.
- (vi) Grout frame inside and out to make watertight. Remove excess grout from inside of manhole.
- (vii) Install cast iron lifter ring as directed by the Contract Administrator.
- (viii) Place and compact Class 2 backfill as required in accordance with CW 2030 and SD-002.

E41.4 Measurement and Payment

(a) Adjustment of Existing Manitoba Hydro Manholes

- (i) Adjustment of existing Manitoba Hydro manholes will be measured on a unit basis and paid for at the Contract Unit Price for "Adjustment of Existing Manitoba Hydro Manholes". The number of units to be paid for will be the total number of existing Manitoba Hydro manhole frames adjusted, including installation of new covers and lifter rings, in accordance with this Specification, accepted and measured by the Contract Administrator.

E42. ASPHALT PAVEMENT SPECIAL PROVISIONS

E42.1 Description

- (a) The asphalt pavement Special Provisions found in Appendix 'D' apply to the Work.

E42.2 Measurement and Payment

- (a) The asphalt pavement Special Provisions will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E43. SUPPLY AND INSTALL DETECTABLE BAR TILES

E43.1 Description

E43.1.1 This Specification shall cover all operations relating to the supply and installation of detectable bar tiles in concrete sidewalk.

E43.1.2 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 Work as hereinafter specified.

E43.2 Materials

E43.2.1 Acceptable Directional Bar Tile product is:

- (a) 305mm x 610mm (12" x 24") Cast-in-Place (Wet Set) with Anchors – Manufactured by ADA Solutions.
 - (i) Part # 1224BAR375Y
 - (ii) Flush Mount, Federal Yellow
 - (iii) Fasteners: 6mm Dia. x 38mm Long SS FH Bolts (Hex Drive) and 6mm Dia. x 38mm Long Zinc Inserts
 - (iv) Sealant: Manufacturer recommended

E43.3 Equipment

E43.3.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E43.4 Construction Methods

E43.4.1 Installation Instructions for Directional Bar Tiles

- (a) Install Wet Set Replaceable units as per manufacturer's recommendations, and as shown on Drawings.
- (b) Where necessary, cut Wet Set Replaceable units accurately using a 60 tooth carbide or diamond blade with a suitable cutting device. No cut unit shall measure less than 250mm in length. In accordance with manufacturer's recommendations, supplemental fasteners and inserts shall be added as needed when the distance between the cut face of the unit and the original hardware exceeds 100mm.
- (c) Install Wet Set Replaceable units true to grade, in location, layout and pattern as indicated on the contract drawings.
- (d) Wet Set Replaceable units shall be set flush into a minimum 65mm depth of concrete (100mm – 175mm slump). Vibrate or tamp (with a rubber mallet) the Wet Set Replaceable units into the fresh concrete to ensure that there are no voids underlying the units and that the units are flush with the adjacent substrate. Temporary weights can be added as necessary in the event of float during initial set of the units.
- (e) Joint Lines between successive Wet Set Replaceable Units: Maintain a 3mm – 5mm consistent joint line between successive units.
- (f) Tooled Edge Detail: Maintain a 3mm to 6mm tooled edge detail along the perimeter of the Wet Set Replaceable unit installation. Installation of the tooled edge detail facilitates future removal and replaceable of the units.
- (g) Sealant: Fill all Joints and Tooled Edge Details with Sikaflex 1A, BASF NP1, or Tremco Dynamic Sealant. Sealant renders the installation water resistant and provides for a pleasing architectural finish.
- (h) Protective Plastic Sheet: Particularly in direct sunlight and when temperatures exceed 25 degrees C, remove the protective plastic sheeting from the Wet Set Replaceable units within 48 hours of installation of the unit. Failure to do so will be solely at Contractor risk and may result in the protective plastic bonding to the unit thus requiring a considerable effort to remove the protective plastic sheeting.

E43.5 Measurement and Payment

E43.5.1 Directional Bar Tiles

- (a) Directional Bar Tiles shall be measured on a unit basis and paid for at the Contract Unit Price per unit for the "Items of Work" listed here below. The number of units to be paid for shall be the total number of Directional Bar Tiles supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Directional Bar Tiles: 305mm x 610mm tiles.

E44. SALVAGE EXISTING ROADSIDE HAZARD PROTECTION

E44.1 Description

- E44.1.1 This Specification covers all operations relating to the salvage of all existing aluminum balanced barrier rails and posts and crash cushions.
- E44.1.2 The Work to be done by the Contractor under this Specification shall include furnishing of all superintendence, overhead, labor, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E44.2 Materials

- E44.2.1 All existing aluminum balanced barrier rails and posts, crash cushions, and hardware shall be delivered to a City of Winnipeg Storage Yard as directed by the Contract Administrator. At the storage yard, the Contractor shall off-load the salvaged material with his own labour and equipment and place in the designated location indicated by City of Winnipeg Personnel and as directed by the Contract Administrator.

E44.3 Measurement and Payment

- E44.3.1 Salvage Existing Barrier
- (a) Salvaging existing barrier rail and barrier posts shall be measured and paid for in accordance with CW 3650.
- E44.3.2 Salvage Existing Crash Cushion
- (a) Salvaging existing crash cushions will be measured on a unit basis and paid for at the Contract Unit Price for "Salvage Existing Crash Cushion". Number of units to be paid for will be the total number of crash cushions salvaged and delivered in accordance with this Specification, accepted and measured by the Contract Administrator.

E45. REMOVAL OF EXISTING BOLLARDS

E45.1 Description

- E45.1.1 This Specification shall cover the removal of existing bollards.

E45.2 Construction methods

- E45.2.1 Removal of Bollards
- (a) Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which bollards shall be removed.
 - (b) The Contractor shall remove all bollards designated for removal including any concrete bases to 1 metre below proposed grade. The Contractor shall load and haul all materials from the site and dispose of these materials in accordance with Section 3.4 of CW 1130.

E45.3 Measurement and Payment

- E45.3.1 Removal of Bollards
- (a) Removal and disposal of bollards will be measured on a unit basis and paid for at the Contract Unit Price for "Removal of Bollards". The number to be paid for will be the total number of bollards removed and disposed of in accordance with this Specification, accepted and measured by the Contract Administrator.
 - (b) No separate measurement or payment shall be made for the removal and disposal of any concrete bases.

E46. GREEN BIKE LANE TREATMENT

E46.1 Description

E46.1.1 This Specification covers all operations relating to the supply and installation of green bike lane treatment at cycling corridor conflict points and longitudinal lane lines, as noted on the Drawings.

E46.1.2 The Work to be done by the Contractor under this Specification shall include furnishing of all superintendence, overhead, labor, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E46.2 Materials

E46.2.1 The Green Bike Lane Treatment shall be Cycle Grip MMAX by Ennis-Flint color to be EF Bike Lane Green, PumaTrack MMA Cold Applied Surface Treatment by HITEX International Group color to meet MUTCH requirements or equivalent, in accordance with B6 as approved by the Contract Administrator. A link to the manufacturer's specifications is provided:

- (a) Cycle Grip MMAX:
<https://www.ennisflintamericas.com/catalog/product/view/id/945/category/81>
- (b) PumaTrack MMA Cold Applied Surface Treatment:
https://www.hitexinternational.com/wp-content/uploads/2017/03/Hitex_PumaTrack_Website.pdf

E46.3 Equipment

E46.3.1 General

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

E46.4 Submittals

E46.4.1 Prior to construction the Contractor shall submit material data sheets for the proposed product to be supplied and installed to the Contract Administrator.

E46.5 Construction Methods

E46.5.1 Surface Preparation

- (a) Surface Preparation to be in accordance with the Manufacturer's instructions.

E46.5.2 Masking

- (a) Masking of the edges of all green bike lane treatment areas to be in accordance with Manufacturer's instructions.

E46.5.3 Paint Mixing

- (a) Mix paint in accordance with Manufacturer's instructions.

E46.5.4 Installation of Green Bike Lane Treatment

- (a) Install Green Bike Lane Treatment in accordance with Manufacturer's instructions.
- (b) Any damage done to the Green Bike Lane Treatment prior to completion of each marking shall be rectified at the Contractor's expense.

E46.6 Quality Control and Assurance

E46.6.1 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator

including all operations from the selection and production of materials through to final acceptance of the 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.

E46.6.2 Quality Assurance

- (a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator
- (c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. 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.

E46.7 Measurement and Payment

E46.7.1 Green Bike Lane Treatment- Intersection Treatment

- (a) Supply and installation of green bike lane treatment for intersection treatments shall be measured on an area basis and will be paid for at the Contract Unit Price per square metre for "Supply and Installation of Green Bike Lane Treatment - Intersection Treatment" supplied and installed in accordance with this Specification and accepted and measured by the Contract Administrator.
 - (i) No separate measurement will be made whether the treatment is being applied to asphalt pavement or to concrete pavement. The payment made shall cover either instance.

E46.7.2 Green Bike Lane Treatment- Longitudinal Lane Line

- (a) Supply and installation of green bike lane treatment for longitudinal lane lines shall be measured on a length basis and will be paid for at the Contract Unit Price per linear metre for "Supply and Installation of Green Bike Lane Treatment - Longitudinal Lane Line" supplied and installed in accordance with this Specification and accepted and measured by the Contract Administrator.
 - (i) No separate measurement will be made whether the treatment is being applied to asphalt pavement or to concrete pavement. The payment made shall cover either instance.

TRAFFIC SIGNALS SPECIFICATIONS

E47. CUTOVERS (TRAFFIC SIGNALS)

E47.1 Description

E47.1.1 This Specification shall cover all operations relating to cutovers in relation to traffic signals.

E47.1.2 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 Work as hereinafter specified.

E47.2 Construction Methods

E47.2.1 General

- (a) Expose existing conduits where new conduit is specified to be coupled.
- (b) Remove cables from the conduit (if present).
- (c) Cut conduit at specified location.
- (d) Push existing cables into new conduit (if present).
- (e) Couple old and new conduits together as specified in SD-340.
- (f) Backfill as specified in SD-342.
- (g) Restore as directed by the Contract Administrator

E47.3 Measurement and Payment

E47.3.1 Measurement and Payment shall be in accordance with 4.15 of CW 3620.

E48. INSTALLATION OF EARLY OPEN CONCRETE BASES (TRAFFIC SIGNALS)

E48.1 Description

E48.1.1 This Specification shall cover all operations relating to the installation of early open concrete bases.

E48.2 Materials

E48.2.1 Early Open Concrete Bases

- (a) Supply concrete for bases in accordance with CW 2160, Table CW 2160.1 Design Requirements for Concrete Used for Underground Structures, for Type A Structures (monolithic sewers and reinforced structures).
- (b) Further to E26.2(a), the supplied concrete shall achieve a minimum compressive strength of 22 MPa at 48 hours.
- (c) City supplied materials shall be as per Section 2.10 of CW 3620.

E48.3 Construction Methods

E48.3.1 Early Open Concrete Bases

- (a) Install early open concrete bases as per Section 3.7 of CW 3620.

E48.4 Measurement and Payment

E48.4.1 Early Open Concrete Bases

- (a) Installation of concrete bases shall be measured on a unit basis and paid for at the Contract Unit Price per unit for the "Items of Work" listed below. The number of units to be paid for shall be the total number of concrete bases installed in accordance with this Specification, accepted and measured by the Contract Administrator.
- (b) Items of Work:
 - (i) Signal Pole Base Early Open – Type A
 - (ii) Signal Pole Base Early Open – Type OD
 - (iii) Signal Pole Base Early Open – Type G
 - (iv) Signal Pole Base Early Open – Type J

E48.4.2 Payment for the items of work in this Specification include the supply and installation of ready mix or mixed concrete on site.

- E48.4.3 Payment for the items of work listed above include the supply and installation of grounding roads (electrodes) installed with the concrete bases.
- E48.4.4 Payment for the items of work listed above include boring.
- E48.4.5 Payment for the items of work listed above include top ring forms.

E49. SERVICE BOX PRE-CAST (TRAFFIC SIGNALS)

E49.1 Description

- E49.1.1 This Specification shall cover all operations relating to the use and installation of a service box pre-cast (SD-322 Rev 2) 17" x 30" x 18" and 13" x 24" x 18".

E49.2 Materials

- E49.2.1 Materials shall be as per Section 2 of CW 3620.

E49.3 Construction Methods

E49.3.1 Service Box Pre-cast

- (a) Install pre-cast service box in grass boulevards/ medians, and hard surfaced medians or as shown on the Drawings or as directed by the Contract Administrator.
- (b) Fill bottom of excavation with compacted limestone base course material to set precast service box to grade.
- (c) Install pre-cast service box on top of the compacted granular fill material to pavement, sidewalk or boulevard finished grade.
- (d) All conduits must be bundled into a group in the centre of the pre-cast service box. Install plastic plugs prior to backfill.
- (e) Backfill around pre-cast service box exterior. Backfill shall conform with the requirements of SD-342.
- (f) Pre-cast service boxes shall meet the grade of the sidewalk or boulevard given by the Contract Administrator.

E49.4 Measurement and Payment

- E49.4.1 Installation of service boxes shall be measured on a unit basis and paid for at the Contract Unit Price per unit for "Service Box Pre-Cast". The number of units to be paid for shall be the total number of service boxes installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E50. SPLICING CONDUIT (TRAFFIC SIGNALS)

E50.1 Description

- E50.1.1 This specification shall cover all operations relating to splicing conduit in relation to traffic signals.

E50.2 Materials

E50.2.1 Approved Products:

- (a) Plasson Universal Slip Repair Coupler 60-64, Product Code: 176100060064 for use with nominal 2" LDPE.
- (b) Plasson Universal Slip Repair Coupler 48-51, Product Code: 176100048051 for use with nominal 1.5" LDPE.

E50.2.2 Substitutes will not be allowed except:

- (a) Where application has been made to and approval has been provided by Traffic Signals. The Contractor shall provide sufficient information and details to enable the Traffic Signals to determine acceptability.

E50.3 Construction Methods

- E50.3.1 In addition to CW 3620 3.11.12, joining of conduit will not be allowed except:
 - (a) Where joining of conduit is required for Convenience of Road Construction Sequencing with a maximum of one (1) joint per conduit.
- E50.3.2 In place of CW 3620 3.11.13, Joining of conduit shall use an approved oversize coupler to connect nominal size 1.5" or 2" LDPE pipe, IPEX Series 75, installation to follow manufacture's recommendations.
- E50.3.3 Removal of CW 3620 2.10.1 (b) Conduit coupling pipe and gear clamps.

E50.4 Measurement and Payment

- E50.4.1 As per CW 3620 4.11.5, no measurement or payment shall be made for joining of Conduit.

UNDERGROUND WORKS

E51. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO CRITICAL WATER INFRASTRUCTURE

E51.1 Description

- E51.1.1 This Specification details operating constraints for all Work to be carried out in close proximity to critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centreline of a feeder main/large diameter watermain, within 5 m of valve chambers, and any other critical infrastructure identified below.
- E51.1.2 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 Work as hereinafter specified.

E51.2 Scope of Work

- E51.2.1 The following shall be considered critical pipelines and water infrastructure for this project:
 - (a) 750 mm Prestressed Concrete Cylinder Pipe (PCCP) (Lined Core) Fort Garry-St. Vital Feeder Main conforming to AWWA Standard C301-84. The Fort Garry Feeder Main runs east along the southern edge of Abinojii Mikanah. The pipeline crosses Abinojii Mikanah in two places at both the west and east sides of the overpass and crosses Pembina Highway, south of the overpass structure. It was manufactured and relocated as part of the Bishop Grandin Blvd Extension project in 1988.
 - (b) South Ft. Garry Sub-Feedermain Offtake and Valve Chamber located to the west of the CN Letellier Subdivision tracks near Abinojii Mikanah.
 - (c) Pembina Highway Offtake and Valve Chamber located SW of the Abinojii Mikanah and Pembina Highway Interchange.
 - (d) University Crescent Offtake and Valve Chamber located directly adjacent to University Crescent / NB to EB Ramp.
 - (e) Plaza Drive Offtake and Valve Chamber located adjacent to the WB to SB/NB ramp, on the south side of Abinojii Mikanah.
 - (f) 1650 mm PCCP (Embedded Core) Branch II Aqueduct conforming to AWWA Standard C301-84. The Branch II Aqueduct crosses the Red River between the Fort Garry Bridges before crossing the WB lanes of Abinojii Mikanah and running west along the northern edge of Abinojii Mikanah, crossing Pembina Highway north of the

overpass structure. It was manufactured and relocated as part of the Bishop Grandin Blvd Extension project in 1988.

E51.2.2 General Considerations for Work in Close Proximity to Critical Water Infrastructure

- (a) Feeder mains and large diameter water mains are a critical components of the City of Winnipeg's regional water supply and distribution system and work in close proximity to critical water infrastructure shall be undertaken with an abundance of caution. Feeder mains and large diameter 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.
- (b) Work around critical water infrastructure shall be planned and implemented to minimize the time period that Work is carried out in close proximity the pipeline/structure and to ensure that the pipeline/structure is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.
- (c) 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.

E51.3 Submittals

E51.3.1 The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of scheduled Work on the Site, the proposed construction equipment specifications, including:

- (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
- (c) load distributions in the intended operating configuration.

E51.3.2 The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of scheduled Work on the Site, a construction method statement, including:

- (a) proposed construction plan including excavation locations, haul routes, excavation equipment locations, and loading positions;
- (b) excavation plans, including shoring designs, for excavations occurring in close proximity to critical water infrastructure (within 5 m horizontal of the pipe's centerline);
- (c) any other pertinent information required to accurately describe the construction activities in close proximity to the critical water infrastructure and permit the Contract Administrator to review the proposed construction plans.

E51.4 Materials

E51.4.1 General

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

E51.4.2 Feeder Main Insulation Materials

- (a) High Strength Rigid Insulation for below grade: 50 mm thick rigid insulation to CAN/ULC S701, Type 4 rigid, closed cell type, with integral high density skin, extruded polystyrene insulation, 610 mm wide x 2440 mm long, edge treatment: butt

edge and ship lapped. As manufactured by DOW Chemical, Owens Corning, or approved equal in accordance with B7.

E51.5 Equipment

E51.5.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E51.6 Construction Methods

E51.6.1 Operational Limitations

- (a) Feeder main and large diameter water main shutdowns are scheduled based on a number of factors including water demand, weather, reservoir operation, routine maintenance and repair work within the regional distribution system, and other factors. The City shall endeavour to make requested time periods available to the Contractor to schedule their work requiring removal of the pipeline from service, without limiting the City's control over the operation of the regional water and distribution systems to complete other work, maintain adequate water storage and supply and maintain the integrity of the infrastructure. The City shall reserve the right to cancel and/or delay these schedule dates at any time, due to any circumstances that could adversely affect the City's water supply including, but not limited to, high water demand, abnormal weather, failures of related water system components and/or security concerns.
- (b) Work shall be planned to be completed with all critical water infrastructure in service and under normal operation.

E51.6.2 Pre-Work, Planning and General Execution

- (a) No work shall commence in close proximity to feeder mains, large diameter watermain, chambers, and other 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.
- (b) Notify the Contract Administrator five (5) Business Days prior to commencement of any work near the critical water infrastructure.
- (c) The Drawings provide the location of the feeder mains, chambers, and critical pipelines through the construction site. Pipe locations noted on the Drawings are based on the original record drawings. Locate critical infrastructure and confirm their position horizontally and vertically (if required) prior to undertaking work in close proximity to said infrastructure. Visually delineate all critical infrastructure identified herein on Site by use of paint, staking/flagging, construction fencing, snow fencing, or other suitable methods.
- (d) Only utilize construction practices and procedures that do not impart excessive vibratory loads on critical water infrastructure or that would cause settlement of the subgrade below critical water infrastructure.
- (e) 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.
- (f) 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.
- (g) 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).

- (h) Granular material, construction material, soil, and/or other material shall not be stockpiled on the pipelines or within 5 m of any critical infrastructure identified herein.
- (i) The Contractor shall ensure that all crew members understand and observe the requirements of working near critical water 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 critical water infrastructure. 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.

E51.6.3 Demolition, Excavation, and Shoring

- (a) Use of pneumatic concrete breakers within 3 m of critical water infrastructure is prohibited. Pavement shall be full depth sawcut and carefully removed. Use of hand held jackhammers for pavement removal will be allowed.
- (b) Offset excavation equipment a minimum of 3 m from the centerline of critical pipelines when undertaking excavations where there is less than 2.4 m of earth cover over the pipeline.
- (c) 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. 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 or soft excavation methods.
- (d) Equipment should not be allowed to operate while positioned directly over critical water infrastructure except were permitted herein, outlined in the reviewed and accepted construction method statement.
- (e) Excavations within 3 m of the outside edge of critical water infrastructure (hydrovac holes for confirming trenchless installations excluded) and which extend below obvert of the critical water infrastructure shall utilize shoring methods that precludes the movement of native in-situ soils (i.e. a tight shoring system).
- (f) Pre-bore all piles to below the invert of critical infrastructure within 5 m (horizontally) of the pipeline's outside edge.
- (g) Offset pile driving equipment a minimum of 3 m (horizontally) from the centerline of the pipeline during piling operations.

E51.6.4 Feeder Main and Valve Chamber Insulation

- (a) Insulate feeder mains where cover is less than or equal to 2.1 m in accordance with CW2110, SD-018.
- (b) Rigid insulation shall be installed with the top of the insulation flush with the top of the subgrade.
- (c) Rigid insulation sheets shall be installed in a staggered pattern to maximise joint overlap.
- (d) Insulation width shall be 3000 mm measured perpendicular to the axis of the pipe.

E51.6.5 Underground Construction and Trenchless Pipe Installation

- (a) Install pipes to the grades shown on the Drawings. A minimum clear separation distance (outside to outside of pipe wall) of 500 mm shall be maintained between crossing pipes and the critical pipelines, or as shown on the drawings, whichever is greater.

- (b) The Contractor shall locate critical pipelines and confirm their position horizontally and vertically prior to commencing with any trenchless pipe installations to ensure proper clearances are maintained. Under no circumstances should blind coring proceed across feeder mains.
- (c) The Contractor shall visually confirm the location and alignment of the drill rods or jacking pipe (horizontally and vertically) prior to proceeding with the trenchless installation beneath the critical pipelines. It is recommended that the new pipe alignment be confirmed within 2 m of the outside of the critical pipeline but no closer than 0.5 m from the outside edge of the pipe.
- (d) No trenchless methods involving soil displacement (plugs) shall be permitted in the vicinity of critical pipelines.
- (e) Pressure grouting or approved alternative methods shall be used to fill voids caused by the installation or if the bored hole diameter is greater than the outside diameter of the pipe by more than 25 mm.
- (f) Where excavation is required within the critical pipeline's embedment zone, the Contractor shall take steps to ensure the granular embedment material surrounding the pipeline remains stable during the work.

E51.6.6 Subgrade Construction

- (a) Subgrade and backfill compaction within 3 metres (horizontal) of a critical water infrastructure shall be limited to non-vibratory methods only. Small walk behind vibratory packers will be permitted.
- (b) Subgrade, sub-base and base course construction shall be kept in a rut free condition at all times. Construction equipment is prohibited from crossing pipelines if the grade is insufficient to support the equipment without rutting.
- (c) Subgrade conditions should be inspected by personnel with competent geotechnical experience (e.g. ability to adequately visually classify soils and competency of subgrade, subbase, and base course materials). In the event of encountering unsuitable subgrade materials above a critical pipeline, proposed design revisions shall be submitted to the Contract Administrator for review to obtain acceptance from the Water and Waste Department relative to any change in conditions.
- (d) Fill material shall not be dumped directly on critical water infrastructure but shall be stockpiled outside the limits noted in these recommendations and shall be carefully bladed in-place.
- (e) Only use compaction equipment approved by the contract administrator to compact fill materials above critical water infrastructure. Compaction of fill materials shall be completed using static methods only, no vibratory compaction will be allowed within the limits noted in these recommendations.
- (f) Construction operations shall be staged to minimize the time period between excavation to subgrade and placement of granular subbase materials. Should bare subgrade be left overnight, measures shall be implemented to protect the subgrade against inadvertent travel over it and to minimize the impact of wet weather.

E51.6.7 Subbase and Base Course Construction

- (a) 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.
- (b) 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.

E51.6.8 Paving

- (a) When constructing asphalt pavements only non-vibratory compaction should be used within 3 m (horizontal) of the center of critical pipelines.

E51.7 Measurement and Payment

E51.7.1 Protection of Critical Water Infrastructure

- (a) Protection of critical water infrastructure will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E51.7.2 Feeder Main and Valve Chamber Insulation

- (a) Supply and installation of rigid insulation will be measured and paid on a square meter unit basis at the Contract Unit Rate for "Feeder Main and Valve Chamber Insulation" as listed in Form B: Prices. Payment shall include all materials and labour to complete the work.

E51.7.3 Valve Chamber Manhole Rim Adjustment

- (a) The adjustment of the manhole rim elevation will be measured and paid on a lump sum unit basis at the Contract Unit Rate for "Valve Chamber Manhole Rim Adjustment" as listed in Form B: Prices. Payment shall include all materials and labour to complete the work.

E52. REPAIR MANHOLE BENCHING

E52.1 Description

- (a) This Specification covers the repair of benching in existing manholes.

E52.2 Construction methods

- (a) Repair Manhole Benching
 - (a) The Contractor shall remove and dispose of existing loose or crumbling benching mortar or concrete to the satisfaction of the Contract Administrator.
 - (b) The Contractor shall bench and channel manhole floor with mortar or concrete in accordance with CW 2130, SD-010 and SD-011. Flow channels shall curve smoothly and provide a smooth transition between inlet and outlet pipes.

E52.3 Measurement and payment

- (a) Repair Manhole Benching
 - (i) Repair of existing manhole benching will be measured on a unit basis and paid for at the Contract Unit Price for "Repair Manhole Benching". The number to be paid for shall be the total number of manholes that have been repaired in accordance with this Specification, accepted and measured by the Contract Administrator.

E53. REMOVE MANHOLE COVER FROM BOTTOM OF MANHOLE

E53.1 Description

- (a) This Specification covers the removal of a manhole cover from within a manhole.

E53.2 Construction Methods

- (a) Remove Manhole Cover from Bottom of Manhole
 - (i) The Contractor shall remove and dispose of existing manhole cover from the bottom of the manhole without damaging the existing manhole.

E53.3 Measurement and Payment

- (a) Remove Manhole Cover from Bottom of Manhole
 - (i) Removal of manhole cover from bottom of manhole will be measured on a unit basis and paid for at the Contract Unit Price for "Remove MH cover from bottom of Manhole". The number to be paid for shall be the total number of manhole covers

removed in accordance with this Specification, accepted and measured by the Contract Administrator.

E54. PROVISIONAL ITEMS

E54.1 General

- (a) The Provisional Items listed in the Form B Prices are part of the Contract.
- (b) The Contractor shall not perform Work included in Provisional Items without prior authorization from the Contract Administrator. All work included in the Provisional Items will be carried out within the construction areas shown on the Drawings.
- (c) Notwithstanding C7, the City reserves the right to diminish all or any portion of the Items of Work listed in the Provisional Items and no claim shall be made for damages on grounds of loss of anticipated profit or for any other reason.

E54.2 Construction

- (a) Remove and Replace Existing Manhole shall meet the requirements of CW 2130.
- (b) Replace Existing Flat Top Reducer shall meet the requirements of CW 2130.
- (c) Replace Existing Manhole Benching shall meet the requirements of CW 2130.

E54.3 Measurement and Payment

E54.3.1 Remove and Replace Existing Manhole

- (a) Remove and Replace Existing Manhole shall be paid in accordance with CW 2130.

E54.3.2 Replace Existing Flat Top Reducer

- (a) Replace Existing Flat Top Reducer shall be paid in accordance with CW 2130.

E54.3.3 Replace Existing Manhole Benching

- (a) Replace Existing Manhole Benching shall be paid on a unit basis.

LANDSCAPING

E55. TREE REMOVAL

E55.1 Description

- E55.1.1 This Specification covers the removal of individual trees from the Site as designated for removal by the Contract Administrator. The Work shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work.

E55.2 Equipment

- E55.2.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E55.3 Construction Methods

E55.3.1 Tree Removal

- (a) Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which trees and/ or shrubs shall be removed. All other trees and shrubs shall be protected against damage from all construction activity in accordance with E6 Protection of Trees.
- (b) Trees to be removed are to be felled so as to land within the limits of the works. The Contractor shall take all precautions to prevent damage to traffic, structures, pole

lines, adjacent property and to trees and shrubs designated to be saved, and he shall be liable for any damages occurring in the performance of this work.

- (c) The Contractor shall cut down all trees and shrubs designated for removal and grub out all stumps and roots. The Contractor shall load and haul all trees, stumps, roots, logs, brush, rubbish and all other surface litter from the Site and dispose of these materials at dumps located by the Contractor and approved by the Contract Administrator.
- (d) Only Urban Forestry Branch pre-qualified contractors may perform tree removals. Refer to the approved list available at:
http://legacy.winnipeg.ca/publicworks/parksOpenSpace/UrbanForestry/Homeowner_Tree_Maintenance_Guidelines.stm. Submission of a contractor agreement form may be required at the discretion of the Urban Forest Branch.

E55.4 Measurement and Payment

- E55.4.1 Removal of Trees will be paid for at the Contract Unit Price for "Tree Removal", measured as specified herein, which price shall be payment in full for removing and disposing all tree materials and for completing all operations herein described and all other items incidental to the work included in this Specification.