THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 989-2013

PORTAGE AVENUE TWIN BRIDGES OVER STURGEON CREEK REHABILITATION AND RELATED WORKS

TABLE OF CONTENTS

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 PORTAGE AVENUE TWIN BRIDGES OVER STURGEON CREEK REHABILITATION AND RELATED WORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, Wednesday, January 24, 2014.

B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

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

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

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

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

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

B5. CONFIDENTIALITY

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

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

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

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

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

B6. ADDENDA

B6.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/bidopp.asp

B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B6.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B7. SUBSTITUTES

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

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

B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:

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

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

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

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

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

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

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

B7.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

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

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B16.

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.

B7.10 Notwithstanding B7.2 to B7.9, and in accordance with B8.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B16.1(a).

B8. BID COMPONENTS

B8.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Bid Security

(i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

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

B8.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.

B8.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B8.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder’s Bid.

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

B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B16.1(a).

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

B8.8 Bids shall be submitted to:

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

B9. BID

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

B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;

(b) if the Bidder is a partnership, the full name of the partnership shall be inserted;

(c) if the Bidder is a corporation, the full name of the corporation shall be inserted;

(d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;

(b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;

(c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;

(d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

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

B10.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

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

B11. QUALIFICATION

B11.1 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.

B11.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

(a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/debar.stm

B11.3 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);

B11.4 Further to B11.3(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) 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

(b) 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

(c) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/.

B11.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B11.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B12. BID SECURITY

B12.1 The Bidder shall provide bid security in the form of:

(a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or

(b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or

(c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B12.1.1 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.

B12.1.2 All signatures on bid securities shall be original.

B12.1.3 The Bidder shall sign the Bid Bond.

B12.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B12.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B12.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B12.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B12.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B12.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B13. OPENING OF BIDS AND RELEASE OF INFORMATION

B13.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.

B13.1.1 Bidders or their representatives may attend.

B13.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B13.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B13.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B14. IRREVOCABLE BID

B14.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B14.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B15. WITHDRAWAL OF BIDS

B15.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B15.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

B15.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B15.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:

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

(b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and

(c) if the notice has been given by any one of the persons specified in B15.1.3(b), declare the Bid withdrawn.

B15.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B14.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

B16. EVALUATION OF BIDS

B16.1 Award of the Contract shall be based on the following bid evaluation criteria:

(a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation there from (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B11 (pass/fail);

(c) Total Bid Price;

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

B16.2 Further to B16.1(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.

B16.3 Further to B16.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.

B16.4 Further to B16.1(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.

B16.4.1 Further to B16.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17. AWARD OF CONTRACT

B17.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B17.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B17.2.1 Without limiting the generality of B17.2, the City will have no obligation to award a Contract where:

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

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

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

(d) only one Bid is received; or

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

B17.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B16.

B17.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.

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

C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix "**C**" designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The major components of the Work are as follows:

(a) Phase 1 – North Structure (Westbound Lanes)

(i) Coordinate with MTS to disconnect existing power on Bridge;
(ii) Coordinate with Manitoba Hydro to relocate existing street lighting on Bridge;
(iii) Detour traffic to North Structure;
(iv) Remove existing handrail;
(v) Remove existing concrete sidewalk (partial depth);
(vi) Remove existing concrete median (partial depth, full depth);
(vii) Remove existing concrete approach slabs and roadway slabs;
(viii) Remove existing concrete barriers and portion of abutment wingwalls;
(ix) Remove existing abutment back wall;
(x) Remove deteriorated concrete from girder ends;
(xi) Remove existing expansion joints;
(xii) Remove existing barrier curb;
(xiii) Remove existing splash strip;
(xiv) Remove and salvage aluminum balanced barrier;
(xv) Repair girder ends;
(xvi) Construct modified abutments;
(xvii) Complete miscellaneous deck repairs and apply healer/sealer on Bridge;
(xviii) Construct new concrete sidewalk slab overlay, deck slabs and curb on Bridge;
(xix) Construct new reinforced concrete traffic barriers on Bridge and abutments;
(xx) Construct new reinforced median concrete barrier on Bridge and abutments;
(xxi) Construct new reinforced concrete sidewalk approach slabs at approach and roadway slabs;
(xxii) Supply and install new expansion joints;
(xxiii) Construct new reinforced concrete approach, roadway expansion slabs, and reinforced roadway slab;
(xxiv) Supply and install new aluminum pedestrian handrail;
(xxv) Repair miscellaneous areas of concrete;
(xxvi) Construct new monolithic curb and sidewalk, monolithic concrete splash strip, and construct barrier curb;
(xxvii) Reinstall aluminum balanced barrier; and
(xxviii) Coordinate with MTS and Manitoba Hydro for their installation, wiring, and connection of existing conduits. Coordinate with Manitoba Hydro that cables have been relocated to accommodate Phase 2 electrical works.

(b) Phase 2 – South Structure (Eastbound Lanes)

(i) Detour traffic to South Structure;
(ii) Coordinate with Manitoba Hydro to relocate existing street lighting on Bridge;

(iii) Remove existing handrail;
(iv) Remove existing concrete sidewalk (partial depth);
(v) Remove existing concrete median (partial depth, full depth);
(vi) Remove existing concrete approach slabs and roadway slabs;
(vii) Remove existing concrete barriers and portion of abutment wingwalls;
(viii) Remove existing abutment back wall;
(ix) Remove deteriorated concrete from girder ends;
(x) Remove existing expansion joints;
(xi) Remove existing barrier curb;
(xii) Remove and salvage aluminum balanced barrier;
(xiii) Repair girder ends;
(xiv) Construct modified abutments;
(xv) Complete miscellaneous deck repairs and apply healer/sealer on Bridge;
(xvi) Construct new concrete sidewalk slab overlay, deck slabs and curb on Bridge;
(xvii) Construct new reinforced concrete sidewalk approach slabs at approach and roadway slabs;
(xviii) Construct new reinforced concrete traffic barriers on Bridge and abutments;
(xix) Construct new reinforced median concrete barrier on Bridge and abutments;
(xx) Supply and install new expansion joints;
(xxi) Construct new reinforced concrete approach, roadway expansion slabs, and reinforced roadway slab;
(xxii) Supply and install new aluminum pedestrian handrail;
(xxiii) Repair miscellaneous areas of concrete;
(xxiv) Coordinate with Manitoba Hydro for their installation, wiring, and connection of existing conduits; and
(xxv) Supply and install new under bridge lighting and fixtures.
(xxvi) Paint miscellaneous areas of concrete.
(xxvii) Repair areas of grouted rip rap;
(xxviii) Construct new monolithic curb and sidewalk, and construct concrete barrier curb;
(xxix) Reinstall aluminum balanced barrier; and
(xxx) Undertake miscellaneous roadwork repairs.

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

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

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

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

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

(e) **"MTO"** means the Ministry of Transportation Ontario that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(f) **"OPSS"** means the Ontario Provincial Standard Specification that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

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

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is Tetra Tech, represented by:

Emile Shehata, P.Eng.
400-161 Portage Avenue East, Winnipeg, MB R3B 0Y4

Telephone No. 204 954-6907
Facsimile No. 204 988-0546

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

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

D5. CONTRACTOR'S SUPERVISOR

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

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

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

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

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

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

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

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

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

D7. NOTICES

D7.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

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

D7.3 Notwithstanding C21., all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg
Chief Financial Officer

Facsimile No.: 204 949-1174

D7.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:

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

Facsimile No.: 204 947-9155

D8. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

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

D10. SAFE WORK PLAN

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

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

D10.3 Notwithstanding B11.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

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

(a) commercial general liability insurance, in the amount of at least two million dollars ($2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

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

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

D11.2 Deductibles shall be borne by the Contractor.

D11.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.

D11.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D12. PERFORMANCE SECURITY

D12.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

(a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or

(b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or

(c) a certified cheque or draft payable to “The City of Winnipeg”, drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

D12.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D12.2 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13. SUBCONTRACTOR LIST

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

SCHEDULE OF WORK

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

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

(a) a critical path method (C.P.M.) schedule for the Work; and

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

all acceptable to the Contract Administrator.

D14.3 Further to D14.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path, as well as the critical stages identified in D19.

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

D14.5 Further to D14.2(b), the Gantt chart shall be tracked and submitted bi-weekly, to be viewed and discussed at the construction meetings.

D15. COMMENCEMENT

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

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

(a) the Contract Administrator has confirmed receipt and approval of:

(i) evidence of authority to carry on business specified in D9;

(ii) evidence of the workers compensation coverage specified in C6.15;

(iii) the Safe Work Plan specified in D10;

(iv) evidence of the insurance specified in D11;

(v) the performance security specified in D12;

(vi) the Subcontractor list specified in D13; and

(vii) the detailed work schedule specified in D14.

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

D15.3 The City intends to award this Contract by March 10, 2014.

D15.3.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. SEQUENCE OF WORK

D16.1 Further to C6.1, the Work shall be divided into two (2) phases. Each phase shall be subdivided into sub-phases:

D16.1.1 Phase 1 Construction shall take place in the spring and summer of 2014, beginning with rehabilitation works on the North structure (Westbound lanes). Refer to Drawings B178-14-002 for phase details and major construction activities.

D16.1.2 Phase 2 Construction shall take place in the summer and fall of 2014, beginning with rehabilitation works on the South structure (Eastbound lanes). Refer to Drawings B178-14-002 for phase details and major construction activities.

D16.1.3 Immediately following the completion of each Phase of the Work, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other contractors.

D17. WORKING DAYS

D17.1 Further to C1.1(jj), the Contract Administrator's determination of whether or not atmospheric and Site conditions are such that a Working Day is deemed to have elapsed may be based at one time on one type of work while at another time a Working Day may be based on another type of work. When more than one type of major work is involved, the quantity of equipment that must be able to work in order to meet the requirements of a Working Day may vary considerably from that specified in the General Conditions.

D17.2 In the event that incidental work is behind schedule which, in the opinion of the Contract Administrator, should have been or could have been carried out by the Contractor in conjunction with or immediately following work of a major type, the City hereby reserves the right to charge Working Days on the incidental work until such time as it is up to schedule.

D17.3 When the major type of work involves restoration of the site to the condition it was prior to rainfall, Working Days shall not be charged.

D17.4 The Contract Administrator will furnish the Contractor with a daily record for each major type of work showing various information concerning the equipment, the time it worked, could have worked and Working Days charged. This report is to be signed each day by an authorized representative of the Contractor.

D18. RESTRICTED WORK HOURS

D18.1 Further to clause 3.10 of the latest version of the City of Winnipeg Standard Construction Specification 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 Sundays, Statutory Holidays and or Civic Holidays.

D18.2 In accordance with the Manual of Temporary Traffic Control, Sections 2.03, 2.04, 2.05 and 2.06, should the Traffic Management Branch of the Public Works Department require that work on Regional Streets be carried out at night or on Sundays or on public holidays, where permitted by the City of Winnipeg Police Department, or that work be restricted or suspended during peak traffic hours, no additional compensation will be considered to meet these requirements.

D19. CRITICAL STAGES

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

(a) Completion of Phase 1 Construction by July 31, 2014.

(b) Completion of Phase 2 Construction by October 15, 2014.

D20. SUBSTANTIAL PERFORMANCE

D20.1 The Contractor shall achieve Substantial Performance by October 31, 2014.

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

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

D21. TOTAL PERFORMANCE

D21.1 The Contractor shall achieve Total Performance by November 15, 2014.

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

D21.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D22. LIQUIDATED DAMAGES

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

(a) Completion of Phase 1 Construction – One Thousand Dollars ($1,000.00);

(b) Completion of Phase 2 Construction – One Thousand Dollars ($1,000.00);

(c) Substantial Performance – Three Thousand Dollars ($3,000.00);

(d) Total Performance – Five Hundred Dollars ($500.00).

D22.2 The amounts specified for liquidated damages in D22.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

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

D23. SCHEDULED MAINTENANCE

D23.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Seeding as specified in the latest version of the City of Winnipeg Standard Construction Specification CW 3520; and

(b) Reflective crack maintenance during two year maintenance. Warranty as specified in the latest version of the City of Winnipeg Standard Construction Specification CW 3250.

D23.2 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

D24. JOB MEETINGS

D24.1 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. An updated schedule, as detailed in D15.5, will be reviewed at each of these meetings.

D24.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D25. WORK BY OTHERS

D25.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) Manitoba Hydro – Relocation of utility conduits. Refer also to Drawings and E8, "Structural Removals".

(b) MTS Allstream Inc. – Relocation of utility conduits. Refer also to Drawings and E8, "Structural Removals".

(c) Shaw Cable.

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

(e) City of Winnipeg Traffic Signals. Refer also to Drawings and E8, "Structural Removals".

(f) Winnipeg Police Service Half Marathon on Sunday, May 4, 2014, miscellaneous Work taking place for the event.

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

D25.2 The Contract Administrator will attempt to arrange and coordinate Work to be performed by others so that such Work does not interfere with the Work and Schedule of the Contractor. Where Work by others interferes, as determined by the Contract Administrator, with the Contractor's planned Work, the Contractor shall modify his plans and do other Work. Unless the Contract Administrator determines that there was no opportunity for the Contractor to do a similar amount of Work, no consideration will be made to extending the Contract time.

D26. CONTRACTOR LIGHTING DURING CONSTRUCTION

D26.1 The Contractor shall not apply direct lighting to any nearby residential buildings for the construction of the Work.

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

D27. AUTHORIZED WORK ON PRIVATE PROPERTY

D27.1 The Contractor shall confine his Works to the right-of-way or easements as much as possible. Where Work is required to be done on or accessed through private property, the Contractor shall obtain written permission from the property owner and provide a copy to the Contract Administrator.

D28. LAYOUT OF WORK

D28.1 Further to C6, the Contract Administrator shall provide the basic centrelines and a benchmark for construction.

D28.2 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.

D28.3 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.

D28.4 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.

D28.5 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.

D29. COOPERATION WITH OTHERS

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

D30. ENCROACHMENT ON PRIVATE PROPERTY

D30.1 Further to Section 3.11 of CW 3110 of the General Requirements, the Contractor shall confine his Work to the public right-of-ways and construction easements at all times, except if he has received written permission from the property owner. The Contractor shall provide the Contract Administrator with a copy of any written permission he has received to enter onto private property.

D30.2 The Contractor's construction activities shall be confined to the minimum area necessary for undertaking the Work and he shall be responsible for all damage to private property resulting from his Work. Particular care shall be taken to assure no damage is done to buildings, fencing, trees and plants, and provision shall be made to maintain full drainage for private properties during construction.

D31. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D31.1 Further to Section 3.13 of CW 1130 of the General Requirements, special care shall be taken to avoid damage to existing adjacent structures and properties during the course of Work.

D31.2 Any damage caused by the Contractor or his Subcontractors to the adjacent structures of properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

D32. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D32.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

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

D33.1 Further to B11.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B11.4.

D34. ENVIRONMENTAL PROTECTION PLAN

D34.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Plan as herein specified.

D34.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal

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

(ii) Canadian Environmental Protection Act;

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

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

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

(vi) Navigable Waters Protection Act; and

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

(b) Provincial

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

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

(iii) The Environment Act, c.E125;

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

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

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

(vii) The Nuisance Act, c.N120;

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

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

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

(xi) The Workplace Safety and Health Act W210;

(xii) Current applicable Associated Regulations;

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

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

(c) Municipal

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

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

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

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

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

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

D34.3 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

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

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

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

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

(b) Fuel Handling and Storage

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

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

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

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

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

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

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

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

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

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

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

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

(c) Waste Handling and Disposal

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

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

(iii) The Contractor shall, during and at the completion of construction, clean-up the construction area and all resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Manitoba Regulation 150/91. Exceptions

are liquid industrial and hazardous wastes which require special disposal methods (refer to Section 30.5D).

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

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

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

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

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

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

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

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

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

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

(iv) Different waste streams shall not be mixed.

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

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

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

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

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

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

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

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

(e) Emergency Response

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

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

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

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

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

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

(ii) Attend to public safety:

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

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

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

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

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

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

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

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

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

(v) The on-site emergency response coordinator shall contact The Canadian Coast Guard, Kenora, Ontario (807) 468-6441, if the spill material reaches and is on or in the Red or Assiniboine Rivers.

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

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

(f) Noise and Vibration

(i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, and the Province of Manitoba Environment Act Licence, unless otherwise accepted in advance by the Contract Administrator.

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

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

(g) Dust and Emissions

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

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

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

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

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

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

(h) Erosion Control

(i) The Contractor shall develop a sediment control plan prior to beginning construction to the satisfaction of the Contract Administrator.

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

(iii) Sediment control fencing, or other such erosion control structures, shall be employed wherever construction activity increases the potential for runoff to carry sediment into a drainage channel or other watercourse. The Contractor shall inspect all such structures daily during heavy construction activity in the areas of the structures and after a heavy rainfall to ensure their continued integrity.

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

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

(vi) The loss of topsoil and the creation of excessive dust by wind during construction shall be prevented by the addition of temporary cover crop, water, or tackifier, if conditions so warrant.

(i) Runoff Control

(i) Measures shall 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.

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

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

(iv) Soil and fill shall not be stockpiled on immediate watercourse bank areas.

(j) Vegetation

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

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

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

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

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

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

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

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

(k) Landscaping

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

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

(l) Construction Traffic

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

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

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

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

(m) Access

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

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

MEASUREMENT AND PAYMENT

D35. PAYMENT

D35.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D36. WARRANTY

D36.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

BID OPPORTUNITY NO. 989-2013

PORTAGE AVENUE TWIN BRIDGES OVER STURGEON CREEK REHABILITATION AND RELATED WORKS

which is by reference made part hereof and is hereinafter referred to as the “Contract”.

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

(a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
(b) perform the Work in a good, proper, workmanlike manner;
(c) make all the payments whether to the Obligee or to others as therein provided;
(d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
(e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)
(See D12)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 989-2013

PORTAGE AVENUE TWIN BRIDGES OVER STURGEON CREEK REHABILITATION AND RELATED WORKS

Pursuant to the request of and for the account of our customer,

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

WE HEREBY ESTABLISH in your favour our irrevocable Standby Letter of Credit for a sum not exceeding in the aggregate

_____

_____ Canadian dollars.

This Standby Letter of Credit may be drawn on by you at any time and from time to time upon written demand for payment made upon us by you. It is understood that we are obligated under this Standby Letter of Credit for the payment of monies only and we hereby agree that we shall honour your demand for payment without inquiring whether you have a right as between yourself and our customer to make such demand and without recognizing any claim of our customer or objection by the customer to payment by us.

The amount of this Standby Letter of Credit may be reduced from time to time only by amounts drawn upon it by you or by formal notice in writing given to us by you if you desire such reduction or are willing that it be made.

Partial drawings are permitted.

We engage with you that all demands for payment made within the terms and currency of this Standby Letter of Credit will be duly honoured if presented to us at:

_____
(Address)

and we confirm and hereby undertake to ensure that all demands for payment will be duly honoured by us.

All demands for payment shall specifically state that they are drawn under this Standby Letter of Credit.

Subject to the condition hereinafter set forth, this Standby Letter of Credit will expire on

_____ .
(Date)

It is a condition of this Standby Letter of Credit that it shall be deemed to be automatically extended from year to year without amendment from the present or any future expiry date, unless at least 30 days prior to the present or any future expiry date, we notify you in writing that we elect not to consider this Standby Letter of Credit to be renewable for any additional period.

This Standby Letter of Credit may not be revoked or amended without your prior written approval.

This credit is subject to the Uniform Customs and Practice for Documentary Credit (2007 Revision), International Chamber of Commerce Publication Number 600.

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D13)

PORTAGE AVENUE TWIN BRIDGES OVER STURGEON CREEK REHABILITATION AND RELATED WORKS

Name	Address

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

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

E1.3 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
B178-14-001_Sht1	COVER SHEET, LIST OF DRAWINGS AND DESIGN DATA
B178-14-002_Sht2	SITE PLAN AND SCOPE OF WORK
B178-14-003_Sht3	TRAFFIC STAGING – PHASE 1
B178-14-004_Sht4	TRAFFIC STAGING – PHASE 2
B178-14-005_Sht5	GENERAL ARRANGEMENT – PLAN
B178-14-006_Sht6	GENERAL ARRANGEMENT – CROSS SECTIONS
B178-14-007_Sht7	PHASE 1 REMOVALS – NORTH STRUCTURE PLAN
B178-14-008_Sht8	PHASE 1 REMOVALS – SECTIONS AND DETAILS
B178-14-009_Sht9	PHASE 1 REMOVALS – WEST ABUTMENT
B178-14-010_Sht10	PHASE 1 REMOVALS – EAST ABUTMENT
B178-14-011_Sht11	PHASE 1 REMOVALS – GIRDER END REMOVAL AND REPAIR
B178-14-012_Sht12	PHASE 1 CONSTRUCTION – WEST ABUTMENT BACKWALL CONCRETE DETAILS
B178-14-013_Sht13	PHASE 1 CONSTRUCTION – EAST ABUTMENT BACKWALL CONCRETE DETAILS
B178-14-014_Sht14	PHASE 1 CONSTRUCTION – EAST AND WEST ABUTMENT BACKWALLS REINFORCING DETAILS
B178-14-015_Sht15	PHASE 1 CONSTRUCTION – NORTH STRUCTURE PLAN AND SECTIONS
B178-14-016_Sht16	PHASE 1 CONSTRUCTION – NORTH STRUCTURE SIDEWALK AND MEDIAN REINFORCING
B178-14-017_Sht17	PHASE 1 CONSTRUCTION – CONCRETE BARRIER LAYOUT
B178-14-018_Sht18	PHASE 1 CONSTRUCTION – CONCRETE BARRIER DETAILS
B178-14-019_Sht19	PHASE 1 CONSTRUCTION – EAST AND WEST APPROACH SLABS
B178-14-020_Sht20	PHASE 1 CONSTRUCTION – WEST APPROACH SLAB SECTIONS
B178-14-021_Sht21	PHASE 1 CONSTRUCTION – EAST APPROACH SLAB SECTIONS
B178-14-022_Sht22	PHASE 1 CONSTRUCTION – WEST APPROACH SLAB REINFORCING
B178-14-023_Sht23	PHASE 1 CONSTRUCTION – WEST APPROACH SLAB REINFORCING
B178-14-024_Sht24	PHASE 1 CONSTRUCTION – EAST APPROACH SLAB REINFORCING
B178-14-025_Sht25	PHASE 1 CONSTRUCTION – EAST APPROACH SLAB REINFORCING
B178-14-026_Sht26	PHASE 1 CONSTRUCTION – ALUMINUM PEDESTRIAN HANDRAIL LAYOUT
B178-14-027_Sht27	PHASE 1 CONSTRUCTION – ALUMINUM PEDESTRIAN HANDRAIL DETAILS
B178-14-028_Sht28	PHASE 1 CONSTRUCTION – ALUMINUM PEDESTRIAN HANDRAIL DETAILS

B178-14-029_Sht29	PHASE 1 CONSTRUCTION – ALUMINUM PEDESTRIAN HANDRAIL DETAILS
B178-14-030_Sht30	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-031_Sht31	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-032_Sht32	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-033_Sht33	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-034_Sht34	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-035_Sht35	PHASE 1 CONSTRUCTION – EXPANSION JOINT
B178-14-036_Sht36	PHASE 2 REMOVALS – SOUTH STRUCTURE PLAN
B178-14-037_Sht37	PHASE 2 REMOVALS – SECTIONS AND DETAILS
B178-14-038_Sht38	PHASE 2 REMOVALS – WEST ABUTMENT
B178-14-039_Sht39	PHASE 2 REMOVALS – EAST ABUTMENT
B178-14-040_Sht40	PHASE 2 REMOVALS – GIRDER END REMOVAL AND REPAIR
B178-14-041_Sht41	PHASE 2 REMOVALS – PHASING 2A & 2B EXISTING HYDRO CONDUIT PHASING
B178-14-042_Sht42	PHASE 2 CONSTRUCTION – WEST ABUTMENT BACKWALL CONCRETE DETAILS
B178-14-043_Sht43	PHASE 2 CONSTRUCTION – EAST ABUTMENT BACKWALL CONCRETE DETAILS
B178-14-044_Sht44	PHASE 2 CONSTRUCTION – EAST AND WEST ABUTMENT BACKWALLS REINFORCING DETAILS
B178-14-045_Sht45	PHASE 2 CONSTRUCTION – SOUTH STRUCTURE PLAN & SECTIONS
B178-14-046_Sht46	PHASE 2 CONSTRUCTION – SOUTH STRUCTURE SIDEWALK AND MEDIAN REINFORCING
B178-14-047_Sht47	PHASE 2 CONSTRUCTION – CONCRETE BARRIER LAYOUT
B178-14-048_Sht48	PHASE 2 CONSTRUCTION – EAST AND WEST APPROACH SLABS
B178-14-049_Sht49	PHASE 2 CONSTRUCTION – WEST APPROACH SLAB SECTIONS
B178-14-050_Sht50	PHASE 2 CONSTRUCTION – EAST APPROACH SLAB SECTIONS
B178-14-051_Sht51	PHASE 2 CONSTRUCTION – WEST APPROACH SLAB REINFORCING
B178-14-052_Sht52	PHASE 2 CONSTRUCTION – WEST APPROACH SLAB REINFORCING
B178-14-053_Sht53	PHASE 2 CONSTRUCTION – EAST APPROACH SLAB REINFORCING
B178-14-054_Sht54	PHASE 2 CONSTRUCTION – EAST APPROACH SLAB REINFORCING
B178-14-055_Sht55	PHASE 2 CONSTRUCTION – ALUMINUM PEDESTRAIN HANDRAIL LAYOUT
B178-14-056_Sht56	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-057_Sht57	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-058_Sht58	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-059_Sht59	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-060_Sht60	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-061_Sht61	PHASE 2 CONSTRUCTION – EXPANSION JOINT
B178-14-062_Sht62	PHASE 1 CONSTRUCTION – REINFORCING SCHEDULE
B178-14-063_Sht63	PHASE 1 CONSTRUCTION – REINFORCING SCHEDULE
B178-14-064_Sht64	PHASE 2 CONSTRUCTION – REINFORCING SCHEDULE
B178-14-065_Sht65	PHASE 2 CONSTRUCTION – REINFORCING SCHEDULE
B178-14-066_Sht66	ALUMINUM BALANCED BARRIER – LAYOUT AND ELEVATIONS
B178-14-067_Sht67	ALUMINUM BALANCED BARRIER – STANDARD DETAILS
B178-14-068_Sht68	UNDERBRIDGE LIGHTING DETAILS
B178-14-069_Sht69	ROADWORKS – STURGEON ROAD TO TWIN BRIDGES
B178-14-070_Sht70	ROADWORKS – TWIN BRIDGES TO RONALD STREET

GENERAL REQUIREMENTS

E2. SHOP DRAWINGS

E2.1 Description

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

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

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

E2.2 Shop Drawings

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

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

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

E2.3 Contractor's Responsibilities

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

(b) Verify:

(i) Field Measurements;

(ii) Field Construction Criteria; and

(iii) Catalogue numbers and similar data.

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

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

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

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

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

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

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

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

E2.4 Submission Requirements

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

(b) Submit two (2) paper prints of Shop Drawings. The Contract Administrator will retain one (1) copy of all submittals and return one (1) copy to the Contractor.

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

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

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

E2.5 Other Considerations

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

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

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

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

E3. VERIFICATION OF WEIGHT

E3.1 Weight Verification

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

(b) 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.

(c) The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

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

(ii) Observing weighing procedures;

(iii) Random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale; and

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

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

E3.2 Evaluation of Tare Weight

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

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

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

(ii) The mechanically printed tare weight;

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

(iv) The time and date of weighing.

E4. MOBILIZATION AND DEMOBILIZATION

E4.1 Description

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

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

E4.2 Scope of Work

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

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

(ii) Supplying, setting up, laying out, and removing site office facilities as detailed in E5 "Site Office Facilities";

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

(iv) Maintaining and removing any access roadways;

(v) Meeting all requirements of the Navigable Waters Permit; and

(vi) Restoring all existing facilities.

E4.3 Materials

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

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

E4.4 Equipment

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

E4.5 Construction Methods

E4.5.1 Layout of On-Site Work Facilities

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

(b) Possible locations for the Contractor's staging areas include the City of Winnipeg Park areas on the north side of the Bridge. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas.

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

E4.5.2 Cellular Telephone Communication

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

E4.5.3 Secure Site Fencing

(a) A minimum 1.8 m high chain-link secure fence around the site lay-down and Work site areas shall be installed prior to commencement of site activities.

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

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

E4.5.4 Traffic Gates

(a) The Contractor shall supply, install, maintain, and remove steel gates to keep non-Contract traffic and pedestrians out of the Work site, as shown in the Drawings and wherever else required.

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

E4.5.5 Access Roadway

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

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

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

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

E4.5.6 Navigable Water Protection Program

(a) All Work shall take place in accordance with the requirements of the Navigable Waters Permit. The permits are presently being finalized, but will be made available to the Contractor prior to commencement of the Work.

E4.5.7 Restoration of Existing Facilities

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

E4.6 Quality Control

E4.6.1 Inspection

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

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

E4.6.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times. The Contractor shall supply samples to the Contract Administrator

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

E4.7 Measurement and Payment

E4.7.1 Mobilization and Demobilization

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

(i)	Commencement of Construction	30%
(ii)	During Construction	60%
(iii)	Upon Completion of the Work	10%

E5. SITE OFFICE FACILITIES

E5.1 Description

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

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

E5.2 Materials

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

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

E5.3 Equipment

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

E5.4 Construction Methods

E5.4.1 Site Office Facilities

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

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

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

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

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

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

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

(viii) Two separate land lines for a fax machine and a computer modem shall also be supplied and serviced by the Contractor;

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

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

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

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

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

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

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

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

E5.5 Measurement and Payment

E5.5.1 Site Office Facilities

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

E6. TRAFFIC CONTROL AND MANAGEMENT

E6.1 Description

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

(b) This Specification shall include all operations related to establishing and executing the public access and traffic control plan as specified herein and as shown in Drawings B178-14-003 and B178-14-004.

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

E6.2 Scope of Work

(a) The City of Winnipeg is responsible for traffic control related to the movement of vehicles through the Project area in the lanes that are not under construction. The City shall bear all costs associated with these Works. This includes:

(i) Installation of poly post lane delineation for Eastbound and Westbound traffic;

(ii) Barricades to separate work area from active traffic;

(iii) Turning restrictions and related signage for Portage Avenue and side streets;

(iv) All regulatory signage;

(v) Traffic signal modifications and installations (temporary signal poles and indicators, relocations, and reinstallations);

(vi) Daily maintenance of all items above.

(b) The Work done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified, excluding that being performed by the City of Winnipeg as listed above in E6.2(a). This generally includes:

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

(ii) Adjustment of barricades to provide bus stop bays out of main traffic lanes where possible;

(iii) Installation and adjustment of sidewalk barricades stating “sidewalk closed”;

(iv) Maintaining access for busses and emergency vehicles to Booth Dr. and Oakdean Blvd;

(v) Maintaining access to all bus stops (or relocated bus stops);

(vi) Assisting Traffic Services in the setup and closing down of traffic staging between all Phases of work, including sweeping and any clean up associated with these operations;

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

(viii) Daily maintenance of all items listed above.

E6.3 Materials

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

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

E6.4 Equipment

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

E6.5 Notification

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

E6.6 Construction Methods

E6.6.1 General

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

(b) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the above-mentioned manual and shall, at all times, ensure that maximum protection is afforded to the road users and that his operations in no way interfere with the safe operation of traffic.

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

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

(e) 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 or pedestrians.

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

E6.7 Quality Control

E6.7.1 Inspection

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

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

E6.7.2 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.

E6.8 Measurement and Payment

E6.8.1 Traffic Control

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

(i)	Traffic Control Initiation	20%
(ii)	Completion of Phase 1	30%
(iii)	Completion of Phase 2	30%
(iv)	Site Restoration	20%

E7. PEDESTRIAN PROTECTION

E7.1 Description

(a) This Specification shall cover all operations relating to the provision of safe access for pedestrians and cyclists around the construction site and on the paved pathway under the Bridge between the piers and abutments on each side of Sturgeon Creek, as specified herein.

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

E7.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) The supply, erection, and maintenance of pedestrian protection, as specified herein;

(ii) The provision of all signage necessary to direct pedestrian and bicycle traffic;

(iii) The provision of all other measures necessary to ensure safe pedestrian access through the construction site to the satisfaction of the Contract Administrator; and

(iv) It is intended that the Contractor provide pedestrian protection and guidance at all times during the Project.

E7.3 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, details of the proposed enclosure following the completion of each construction phase, and if required due to abnormally high water levels.

E7.4 Materials

E7.4.1 General

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

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

E7.5 Equipment

E7.5.1 General

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

E7.6 Construction Methods

E7.6.1 Pedestrian Protection Enclosure

(a) Pedestrian protection walls at the locations of the underbridge pathway between the piers and abutments (two locations), complete with overhead protection, shall be a minimum of 3000 mm high and 3000 mm wide and shall consist of support posts and minimum 13 mm thick plywood. The support posts shall have provision for anchorage to prevent movement or overturning of the pedestrian protection due to wind, hydraulic, or other loads. The pedestrian protection shall be designed for all applicable loading including wind loading in accordance with the requirements of the Manitoba Building Code. Adequate lighting shall be provided attached to the inside of the temporary pedestrian enclosure. Lighting shall be provided for the length of each pathway enclosure.

(b) A sign shall be installed on each side of the structure instructing cyclists to dismount before entering the enclosure.

E7.6.2 Safety Precautions

(a) The Contractor shall provide flagmen, barricades, railings, signs and warning lights as required at all times to secure the safety of the public and shall comply with all provincial statues and laws in force in Manitoba applicable to the Work of this nature.

E7.6.3 Maintenance of the Pedestrian Protection Enclosure

(a) The Contractor shall maintain the Pedestrian Protection Enclosures in good working order at all times to the satisfaction of the Contract Administrator.

(b) The sidewalk shall be kept free of all construction materials, debris, and equipment.

E7.7 Quality Control

E7.7.1 Inspection

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

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

E7.7.2 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.

E7.8 Measurement and Payment

E7.8.1 Pedestrian Protection

(a) Pedestrian protection shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Pedestrian Protection", performed in accordance with this Specification and accepted by the Contract Administrator. “Pedestrian Protection" shall be pro-rated on a monthly basis over the construction period, 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. Prorated payment shall be based on the following Work:

(i)	Installation	40%
(ii)	Maintenance	30%
(iii)	Removal	30%

E8. STRUCTURAL REMOVALS

E8.1 Description

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

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

E8.2 Referenced Specifications and Drawings

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

(i) City of Winnipeg By-Law No. 7070/97 Part 5 – Control of Discharge into Sewers;

(ii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

E8.3 Scope of Work

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

(i) Removing and disposing of the handrail;

(ii) Removing and disposing of the asphalt overlay on Bridge approaches within the limits of Work;

(iii) Removing and disposing of a portion of the bridge deck sidewalk slab on the Bridge, abutments, and approach slabs;

(iv) Removing and disposing of a portion of the existing deck concrete adjacent to the concrete traffic barriers;

(v) Removing and disposing of existing concrete traffic barriers;

(vi) Removing and disposing of existing concrete median traffic barriers as specified;

(vii) Removing and disposing of the expansion joints;

(viii) Removing and disposing of a portion of the existing abutment back walls;

(ix) Removing and disposing of the approach slabs;

(x) Removing and disposing of a portion of the approach roadways within the limits of Work;

(xi) Undertaking girder end removals at east and west abutments;

(xii) Removing and disposing of any abandoned electrical and communication conduits not removed by others;

(b) The Work also includes:

(i) Temporarily protecting the live MTS, Manitoba Hydro, and City of Winnipeg cables.

(c) Removing concrete and other items with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way into the watercourse.

(d) Providing saw cuts as shown on the Drawings and where otherwise necessary to limit the extent of demolition.

(e) Repairing any over demolition and reinforcing damage to the satisfaction of the Contract Administrator.

(f) Complying with the requirements of the Navigable Waters Protection Program.

(g) All structural removal materials not identified for salvage shall revert to the Contractor for off-site disposal.

E8.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule, clearly illustrating the method and sequence by which he proposes to perform the structural removals, including a description of the measures that will be implemented to meet the environmental requirements. The demolition 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 to describe the following:

(i) Work platforms;

(ii) Type and capacity of equipment;

(iii) Sequence of operations;

(iv) Design of demolition catch platforms; and

(v) Description of the measures that will be implemented to meet the requirements of D34 – Environmental Protection Plan.

(c) 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 Work on Site, a plan detailing the Contractor’s hydrodemolition runoff control and disposal methods and procedures. Wastewater from the hydrodemolition 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 the City's land drainage system unfiltered.

E8.5 Materials

E8.5.1 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.

E8.6 Equipment

E8.6.1 General

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

E8.6.2 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) Demolition catch platforms and work platforms shall not extend beyond the underside of the girders. Drilling into the girders to secure any platforms shall not be permitted.

(c) All access/work platforms shall be restored to the preconstruction condition or better, which shall be incidental to the Work.

(d) Work platforms shall satisfy all requirements of the Navigable Waters Protection Program. The permits are presently being finalized, but will be made available to the Contractor prior to commencement of the Work.

E8.6.3 Hydrodemolition Equipment

(a) The hydrodemolition equipment shall be a self-propelled machine that utilizes a high pressure water jet stream capable of removing concrete to the depths shown on the plans 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 curb or parapets or bridge edges, subject to approval of the Contract Administrator.

E8.7 Construction Methods

E8.7.1 General

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

(b) The Contractor shall provide flagmen, guards, barricades, railings, and necessary warning lights, and whenever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or other construction, to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial Statutes applicable to the Work. The Contractor shall provide all other protective

measures as may be required by any law in force in Manitoba and the Canada Labour Code.

(c) 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.

(d) 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 as all the signs, barricades, and flashers have been erected to the satisfaction of the Contract Administrator.

(e) Traffic and pedestrian control shall conform to the requirements of E6 “Traffic Control and Management” and E7 “Pedestrian Protection”.

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

(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 elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.

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

(i) Provide sawcuts as shown on the Drawings and as herein specified and where otherwise necessary to limit the extent of demolition.

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

(k) Repair any over demolition and reinforcing damage to the satisfaction of the Contract Administrator.

E8.7.2 Protection and Removal of Existing Electrical Cables and Conduits

(a) Protect the MTS, Manitoba Hydro and City of Winnipeg conduits and cables during all structural removals.

(b) MTS conduits (102 mm ID) are located in the north sidewalk and within the median. Prior to the commencement of construction, MTS will be relocating all cables from the north sidewalk to the lower median conduits. Conduits in the median will be live during the course of construction. Remove existing conduits within the expansion joint blockouts and approach sidewalks, as shown on the Drawings.

(c) The City of Winnipeg Traffic Signals has one conduit (127 mm ID) located in the south sidewalk. Remove existing conduit within the expansion joint blockouts and approach sidewalks, as shown on the Drawings.

(d) Manitoba Hydro has two street lighting conduits (50 mm ID) in the north sidewalk and south traffic barrier. Manitoba Hydro will temporarily relocate street lighting cables overhead during construction. This relocation will take place prior to the commencement of construction. Within the north sidewalk, remove existing conduit within the expansion joint blockouts and approach sidewalks, as shown on the Drawings. Within the south traffic barrier, remove existing conduit.

(e) Manitoba Hydro conduits (127 mm ID) are located in the south sidewalk. There are currently four live cables in operation through the bridge structure, including three 35 kv lines which provide power to the Grace Hospital. These cables will remain live during the course of construction. Phase 2 Removals and Construction have been staged to accommodate relocation of these live cables.

(f) Coordination will be required with MTS and Manitoba Hydro for this Work. Provide full-time temporary protection during all structural removals operations to the satisfaction of the Contract Administrator. Contact appropriate utilities when working in the vicinity of their conduit/cables in the event that they want to assign an inspector to the Contractor's Work. The Drawings show approximate locations of utilities. Refer to Drawings and contact utilities for further information regarding specific utility locations.

E8.7.3 Phase 2 Removals and Staging of Manitoba Hydro's Live Cables

(a) Phase 2 Removals and Construction have been staged to accommodate relocation of Manitoba Hydro's live cables. Structural Removals between the sidewalk, expansion joint blockouts, the approach sidewalk slabs will require a specific sequence. Manitoba Hydro will relocate cables prior to the commencement of construction to match the occupied conduit configuration for Phase 2A Removals shown on Drawing B178-14-041.

(b) Abutment removals will also require protection and coordination beneath the live cables. It is possible to have temporary power shutdown during removals. Coordinate with Manitoba Hydro to make arrangements for safety watches and temporary power shutdown as required.

(c) As part of the Work associated with Phase 2A Removals, upon completion of concrete removals along the sidewalk, the expansion joint blockouts, and the approach slabs, remove existing conduit at the locations specified on the Drawings. New conduit and expansion assemblies, as shown on the Drawings and described in E21, "Electrical Conduits" shall be installed and spliced to existing conduits prior to commencing Phase 2B Removals.

(d) Temporary protection will be required for the conduits exposed during Phase 2A Removals, as these conduits will become occupied with live cables during Phase 2B Removals. Temporary protection shall be a four-sided plywood box, or equivalent, as approved by the Contract Administrator.

(e) The Contractor shall coordinate all removal operations with Manitoba Hydro and make arrangements to have cables relocated to Phase 2B configuration as shown on Drawing B178-14-041.

(f) As part of the Work associated with Phase 2B Removals, upon completion of concrete removals along the sidewalk, the expansion joint blockouts, and the approach slabs, remove existing conduit at the locations specified on the Drawings. New conduit and expansion assemblies, as shown on the Drawings and described in E21, "Electrical Conduits" shall be installed and spliced to existing conduits.

E8.7.4 Details of Existing Structure

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

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

E8.7.5 Sequence of Structural Removals

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

E8.7.6 Removal of Handrail

(a) Remove and dispose of the handrail.

E8.7.7 Removal of Asphalt Overlay

(a) The asphalt overlay shall be completely removed by rotomilling, scraping, or other means as approved by the Contract Administrator. Remove material from Site.

E8.7.8 Removal of Sidewalk Slab

(a) Remove the concrete sidewalk slab to the depths and limits of removals for each construction phase, as specified on the Drawings.

(b) This shall also include the removal of the approach sidewalk slabs for each construction phase, as shown on the Drawings.

(c) The concrete sidewalk slab on the Bridge may be removed by a combination of rotomilling and hydrodemolition, or other means, as approved by the Contract Administrator. It is permissible to undertake concrete removals using a skid steer with rotomill attachment, followed by the use of a hand-held hydrodemolition lance to undertake removals as shown on the Drawings.

(d) The existing sidewalk concrete surface shall be roughened and prepared in accordance with ICRI Guideline No. 03732 CSP6 (Medium Scarification).

(e) The concrete sidewalk slab on the abutments and approaches shall be removed and disposed of for each construction phase, as shown on the Drawings.

(f) Remove existing granular compacted backfill required for structural removals and removals of existing conduits as shown on the Drawings. Remove existing granular compacted backfill as required for the installation of new conduits and placement of new concrete, as shown on the Drawings.

E8.7.9 Removal of Deck Slab

(a) Remove the concrete deck slab to the depths and limits of removals for each construction phase, as specified on the Drawings.

(b) The concrete deck slab may be removed by a combination of rotomilling and hydrodemolition, or by other means, as approved by the Contract Administrator. It is permissible to undertake concrete removals using a skid steer with rotomill attachment, followed by the use of a hand-held hydrodemolition lance to undertake removals as shown on the Drawings.

(c) The existing deck slab concrete surface shall be roughened and prepared in accordance with ICRI Guideline No. 03732 CSP6 (Medium Scarification).

E8.7.10 Removal of Traffic and Median Barriers

(a) Traffic and median barrier concrete shall be removed for each construction phase, to the limits specified on the Drawings.

(b) Removals shall be undertaken using a combination of sawcutting, scraping, and chip hammering, or by other means, as approved by the Contract Administrator.

(c) Upon completion of removals using the methods above, the concrete surface shall be prepared by the use of a hand-held hydrodemolition lance.

(d) The existing concrete surface shall be roughened and prepared in accordance with ICRI Guideline No. 03732 CSP6 (Medium Scarification).

E8.7.11 Expansion Joints

(a) Remove and dispose of the existing Bridge deck expansion joints and seals for each construction phase, as shown on the Drawings.

(b) Concrete encasing the expansion joints and shall be removed to the limits shown on the Drawings.

(c) Equipment used for the removal of the expansion joints and expansion joint dams shall be selected so that no damage is caused to the remaining deck and abutment concrete.

(d) Concrete shall be roughened and prepared in accordance with ICRI Guideline No. 03732, CSP4 (Light Scarification).

E8.7.12 Removal of Approach Slabs

(a) Remove and dispose of the approach slabs for each construction phase, as shown on the Drawings.

(b) Remove existing granular compacted backfill required for structural removals as shown on the Drawings. Remove existing granular compacted backfill as required for the placement of new concrete, as shown on the Drawings.

E8.7.13 Removal of Roadway Slabs

(a) Remove and dispose of approach roadway slabs for each construction phase, as shown on the Drawings.

(b) Remove existing granular compacted backfill required for structural removals as shown on the Drawings. Remove existing granular compacted backfill as required for the placement of new concrete, as shown on the Drawings.

E8.7.14 Girder End Repairs

(a) Following removal of the existing abutment back wall, the Contract Administrator shall undertake an inspection to assess the condition of the girder ends and will confirm the extent of girder removal areas.

(b) Girder end repairs shall be undertaken as specified on the Drawings. Details show a conservative removal approach, in which concrete from girder ends shall be removed for a depth of 150 mm. This assumption was made as it was not possible to assess the current condition of the girders with the abutment back walls in place. This extent of removal shall be categorized as "Full Depth Removals".

(c) Upon inspection of the girder ends, the Contract Administrator shall provide confirmation of the necessity of full depth removals. If the condition of the concrete girder ends is not as deteriorated or extensive as has been anticipated, the Contract Administrator shall provide direction for areas in which shallower removals shall be undertaken. This type of removal shall be categorized as "Partial Depth Removals". Partial depth removals shall consist of concrete removal up to the mid height of the first layer of reinforcing steel and/or prestressing strands. Removals of this type shall take place as described in the Drawings for partial depth repairs.

(d) Removals shall be undertaken using a combination of sawcutting, scraping, and chip hammering, or by other means, as approved by the Contract Administrator.

(e) Upon completion of removals using the methods above, the concrete surface shall be prepared by the use of a hand-held hydrodemolition lance.

(f) Concrete shall be roughened and prepared in accordance with ICRI Guideline No. 03732, CSP4 (Light Scarification).

E8.7.15 Abutment Removals

(a) Remove and dispose of abutment concrete to the limits shown on the Drawings.

(b) The final surface preparation of the abutment concrete to remain shall be conducted by hydrodemolition, or other means as approved by the Contract Administrator. The resulting surface shall achieve the required grades, while being roughened to the 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).

(c) Remove existing granular compacted backfill required for abutment removals as shown on the Drawings.

(d) All abutment demolition operations, as well as all surface preparation of existing concrete associated with the construction of the modified abutments shall be incidental to this Work.

E8.7.16 Removal Methods by Hydrodemolition

(a) Prior to the commencement of the removal operation by hydrodemolition, the hydrodemolition equipment shall be calibrated on an area of sound concrete approximately 600 x 1500, 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; and

(iv) Nozzle speed.

(b) 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.

(c) Wastewater from the hydrodemolition 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, of 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.

(d) Openings shall be plugged during the hydrodemolition process.

(e) 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.

(f) Where applicable, any "shadowing" of the reinforcing steel by concrete not removed by the process of hydrodemolition shall be removed by the Contractor through other approved means.

(g) After the hydrodemolition is completed, the deck surface shall be inspected through methods of sounding by the Contract Administrator to ensure that deteriorated concrete has been removed. Should deteriorated concrete be found, the Contractor shall remove the areas of deteriorated concrete by additional passes of the hydrodemolition equipment or other equipment approved by the Contract Administrator. Payment for removal of these areas shall be considered as part of Stage III deck concrete removals.

(h) Upon completion of the hydrodemolition of each section of the Work, the Contractor shall remove all cuttings, slurry containing the products of hydrodemolition, 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.

(i) There is a possibility that during hydrodemolition blow-throughs of the sidewalk or deck may occur. Since it is difficult to predict when or even if a blow-through will occur, the following contingency plan shall be undertaken by the Contractor for this eventuality:

(i) In instances where a blow-through of the deck or sidewalk does occur, the Contractor will be required to halt the water jet immediately and stop the flow of water and deck solids. The latter may be accomplished by immediately placing sandbags in the location of the blow-through opening. Sandbags shall be supplied on standby by the Contractor for just such an occurrence.

(j) All exposed reinforcing steel which is left unsupported by the hydrodemolition 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.

E8.7.17 Abutment Removals

(a) Remove and dispose of abutment concrete to the limits shown on the Drawings.

(b) The final surface preparation of the abutment concrete to remain shall be conducted by hydrodemolition, or other means as approved by the Contract Administrator. The resulting surface shall achieve the required grades, while being roughened to the following requirements:

(i) For horizontal surfaces, concrete shall be removed to a “Medium Scarification” profile, or in accordance with the ICRI Guidelines No. 03732, CSP6.

(ii) For vertical surfaces, concrete shall be removed to a “Light Scarification” profile, or in accordance with the ICRI Guidelines No. 03732, CSP4.

(c) Remove existing granular compacted backfill required for abutment removals as shown on the Drawings.

(d) All abutment demolition operations, as well as all surface preparation of existing concrete associated with the construction of the modified abutments shall be incidental to this Work.

E8.7.18 Waste Handling and Disposal of Removed Materials

(a) Dispose of all surplus and unsuitable material off-site, in accordance with D34, “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.

E8.8 Quality Control

E8.8.1 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.

E8.8.2 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.

E8.9 Measurement and Payment

E8.9.1 Structural Removals

(a) Structural removals shall not be measured. This structural removal Work shall be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below,

performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(i) Structural Removals

(i) Handrail;
(ii) Asphalt Overlay;
(iii) Sidewalk Slab;
(iv) Deck Slab;
(v) Traffic and Median Barriers;
(vi) Expansion Joints;
(vii) Approach and Roadway Slabs; and
(viii) Abutments.

E8.9.2 Structural Removals

(a) Structural removals shall be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(i) Girder Ends

(i) Partial Depth Removals; and
(ii) Full Depth Removals.

E9. STRUCTURAL EXCAVATION

E9.1 Description

(a) This Specification shall cover all operations relating to the clearing, grubbing, and structural excavation for abutment and approach slab Works, as specified herein and in the latest version of the City of Winnipeg Standard Construction Specification CW 2030, and as shown on the Drawings.

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

E9.2 Referenced Specifications and Drawings

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

(i) CW 2030 – Excavation Bedding and Backfill.

E9.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Excavating all material required to construct the Works, including clearing and grubbing operations for abutment modifications, approach slab works, and electrical conduit Works;

(ii) The design, fabrication, erection, and removal of all temporary shoring, and such temporary protective measures as may be required to construct the Works;

(iii) Off-site disposing of surplus and unsuitable material; and

(iv) Dewatering of all excavations, as required, for the abutment and approach slab Works.

E9.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on the Site, detailed design calculations and Shop Drawings for all shoring that is signed, sealed, and dated by a Professional Engineer experienced in shoring design and licensed to practice in Province of Manitoba.

(c) The Professional Engineer who designed the shoring system shall inspect the shoring system during construction, and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.

E9.5 Materials

E9.5.1 General

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

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

E9.5.2 Testing

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

E9.5.3 Excavation

(a) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, surplus concrete pavement, asphalt pavement, earth, gravel, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, or all other material of whatever character which may be encountered.

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

E9.6 Equipment

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

E9.7 Construction Methods

E9.7.1 Excavation

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

(b) The shored excavations shall be made in a manner such that all abutment Works may be properly constructed to the required depths and without reduction of dimensions as shown on the Drawings.

(c) The dimensions of the shored excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal and the

construction of cutoff trenches and/or sumps to permit the pumping of water outside the limits of the excavations.

(d) Excavations shall be completed to the elevations required to construct the Works or to such other elevations as may be directed by the Contract Administrator in the field. Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

(e) All material shall be brought to the surface by approved method, and shall be disposed of away from the Site and not into the existing river channel. Shored excavations shall be dewatered and maintained dewatered so that the material is excavated in its natural state. The bottom of the excavation shall be kept free from excessive moisture or free-flowing water.

E9.7.2 Alterations to Site

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

E9.7.3 Protection of Existing Embankment Slopes

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

E9.7.4 Excess Material

(a) All excess excavated material shall become the property of the Contractor and shall be removed from the Site. Excavated material shall not be disposed of in a manner that will obstruct the flow of watercourses.

E9.8 Quality Control

E9.8.1 Inspection

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

(b) 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.

(c) 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.

E9.8.2 Access

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

E9.9 Measurement and Payment

E9.9.1 Structural Excavation

(a) Structural excavation shall be considered incidental to the applicable portions of structural Work requiring excavation, and no separate measurement or payment shall be made for this Work.

E10. STRUCTURAL BACKFILL

E10.1 Description

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

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

E10.2 Referenced Specifications and Drawings

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

E10.3 Scope of Work

(a) The Work under this Specification shall involve:
  (i) Backfilling suitable excavated site material around the east and west abutments;
  (ii) Supplying and placing granular backfill for the east and west approach slabs;
  (iii) Supplying and placing granular backfill for abutment modification Work at the east and west abutment backwalls;
  (iv) Supplying and placing granular backfill around the electrical conduits from the abutment backwalls and the approach sidewalk slabs;
  (v) Supplying and placing granular backfill for the approach sidewalk slabs;
  (vi) Supplying and placing structural backfill for all other elements required to construct the Works.

E10.4 Submittals

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

E10.5 Materials

E10.5.1 General

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

(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.

E10.5.2 Suitable Site Backfill

(a) Suitable site backfill material shall be of a type approved by the Contract Administrator and shall conform to the requirements of the latest version of the City of Winnipeg Standard Construction Specification CW 3170.

(b) Excavated material may be used for backfilling provided it meets the above requirements.

E10.5.3 Granular Backfill

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

E10.5.4 Equipment

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

E10.6 Construction Methods

E10.6.1 Backfilling

(a) All materials shall be accepted by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

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

(c) Backfill materials shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Backfill shall not be placed on frozen subsoil.

E10.7 Quality Control

E10.7.1 Inspection

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

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

(c) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the Owner for any materials taken by the Contract Administrator for testing purposes.

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

(e) All backfilling work shall take place under the supervision of the Contract Administrator. The Contractor shall notify the Contract Administrator when backfilling work is to take place.

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

E10.7.2 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.

E10.8 Measurement and Payment

E10.8.1 Structural Backfill

(a) Supplying and placing structural backfill shall be paid for at the Contract Unit Price per cubic metre for the "Items of Work", listed here below, measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(ii) Supply and Place Structural Backfill

(i) Granular Backfill; and

(ii) Suitable Site Backfill Material.

E11. REINFORCING STEEL

E11.1 Description

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

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

E11.2 Referenced Specifications and Drawings

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

(i) ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes;

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

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

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

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

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

E11.3 Scope of Work

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

E11.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor, and the qualifications of Operators, the Shop Drawings including bar lists, and the mill certificates, including corrosion test results in accordance with ASTM A955M.

The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.

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

E11.5 Materials

E11.5.1 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.

E11.5.2 Handling and Storage of Materials

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

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

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

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

E11.5.3 Handling and Storage of Stainless Steel Reinforcing

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

(b) Chains or steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Use wood or other soft material to protect the bars, or use nylon or polypropylene slings.

(c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.

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

E11.5.4 Reinforcing Steel

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

(b) Reinforcing steel shall be stainless steel, a high-manganese, low-nickel, nitrogen-strengthened austentic 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 E11.1, “Type of Stainless Steel Reinforcing”. Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimensions recommended by RSIC.

(c) 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.

(d) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross sectional area, and tensile properties of a hand-wire-brushed specimen are not less than the requirements of ASTM A955M.

TABLE E11.1 TYPE OF STAINLESS STEEL REINFORCING		
Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205 Duplex	2205	S32205
Type 2304 Duplex	2304	S32304

E11.5.5 Bar Accessories

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

(b) Bar chairs, bolsters, and bar supports shall be made from cementitious material. No plastic or PVC, or galvanized bar supports shall be used.

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

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

(e) Tie wire shall be the following:

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

(f) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E11.5.6 Mechanical Splices

(a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, Type 316L, Type 2205, or Type 2304.

E11.5.7 Bonding Agent/Grout

(a) Epoxy resin shall be conform to the requirements of ASTM C881. Type I or Type IV, Grade 3 epoxy shall be used for bonding reinforcing steel into hardened concrete. An approved product is Hilti RE500 or equal, as approved by the Contract Administrator in accordance with B7, “Substitutes”.

(b) An aggregate filler may be used in accordance with manufacturer's directions when the drilled hole is sized for the head of a stud rather than a shaft only.

(c) Bonding agents for bonding reinforcing steel into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within 48 hours after installation.

(d) Fabrication of stainless steel reinforcing shall take place in an area isolated from carbon steel reinforcing to prevent surface contamination.

(e) Stainless steel reinforcing shall be stored separately from carbon steel reinforcing.

(f) All equipment shall be cleaned prior to bending stainless steel reinforcing.

E11.6 Equipment

E11.6.1 General

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

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

E11.7 Construction Methods

E11.7.1 Fabrication of Reinforcing Steel

(a) All reinforcing steel shall be fabricated in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.

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

E11.7.2 Fabrication of Stainless Steel Reinforcing

(a) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and non-stainless steels.

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

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

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

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

E11.7.3 Stock Length Reinforcing Steel

(a) The Contractor shall stock all reinforcing steel required for new girder end stirrups, Mark G1603 (880 kg) locally. Upon confirmation of the condition of the existing girders, the Contract Administrator shall provide instruction for the revised bend details of these stirrups, to match field conditions.

(b) The Contractor shall order additional stainless steel reinforcing to be ordered and used on site as stocked steel, if and as required. The Contractor shall order the following stainless steel reinforcing to be stocked, bent, and used locally:

(i) 20 – 16 diameter bars, 12 m long

(ii) 20 – 19 diameter bars, 12 m long

(iii) 20 – 25 diameter bars, 12 m long

(c) If the stock lengths are not used for the Work, reinforcing shall be delivered to the City of Winnipeg's Bridge Yard at 849 Ravelston Ave. W. A minimum of twenty-four (24) hours' notice is required prior to delivery of stock length material. Contact is Mr. Mike Terleski, 204-794-8510.

E11.7.4 Placing and Fastening of Reinforcing Steel

(a) General

(i) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.

(ii) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

(iii) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices shall not be permitted.

(iv) Reinforcing steel shall be placed to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.

(v) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel shall not be permitted without prior acceptance by the Contract Administrator.

(vi) Reinforcing steel shall be placed within the tolerances specified in CAN/CSA A23.1.

(vii) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.

(viii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel, shall be as specified in E11.5.5 “Bar Accessories”.

(ix) Welding or tack welding is not permitted.

(x) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

(b) Placing Stainless Steel Reinforcing

(i) Stainless steel reinforcing will be rejected if:

- Any area of contamination of the stainless steel by iron exceeds 100 mm in length;
- Two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or
- There are frequent small occurrences of rust contamination along the full length of the bar.

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

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

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

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

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

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

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

E11.7.5 Splicing

(a) General

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

(ii) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of thirty-five (35) bar diameters lap length shall be provided.

E11.7.6 Installing Reinforcing Steel into Hardened Concrete

(a) The Contractor shall drill holes into adjacent slabs for hooks of the diameters and depths specified for each size of reinforcing steel, as shown on the Drawings. Drill bits shall have a diameter no larger than 2 mm larger than the nominal dowel, tie bar, or stud diameter.

(b) Holes shall be located to the correct depth and alignment as indicated on the Drawings. The spacing of the holes shall be as per RSIC.

(c) Drilling equipment shall be operated so as to ensure that no damage to the pavement results from such drilling operation. Coring of holes is not permitted. In the event that existing reinforcing steel bars are hit during the drilling operations, the hole shall be abandoned and a new hole shall be drilled nearby to the correct depth. All abandoned holes shall be filled with non-shrink grout.

(d) Holes for reinforcing steel shall be blown clean with compressed air. Bonding agent shall be placed in the back of the drilled hole. The reinforcing steel shall be worked back into the holes for complete coverage around the portion of the bar that extends into the hole, such that bonding agent is squeezed from the hole.

(e) Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any new concrete is placed. Otherwise, the concrete may be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

E11.8 Quality Control

E11.8.1 Inspection

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

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

(c) A minimum of one (1) Business Day advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcing steel.

(d) After all reinforcing steel has been placed; a final inspection shall be made prior to the placement of concrete to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Contract Administrator before concrete is placed.

E11.8.2 Access

(a) The Contract Administrator shall be afforded full access for the inspection and control testing of reinforcing steel, both at the Site of Work and at any plant used for the fabrication of the reinforcing steel, to determine whether the reinforcing steel is being supplied in accordance with this Specification.

E11.9 Quality Assurance

E11.9.1 Testing

(a) Quality Assurance testing shall be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

(b) The Contractor shall provide, without charge, the samples of reinforcing steel required for Quality Assurance Tests and provide such assistance and use of tools and construction equipment as is required.

E11.10 Measurement and Payment

E11.10.1 Stainless Steel Reinforcing

(a) Supplying and placing stainless steel reinforcing shall be paid for at the Contract Unit Price per kilogram for "Supply and Place Stainless Steel Reinforcing", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The mass to be paid for shall be the total number of kilograms of stainless steel reinforcing supplied and placed in accordance with this Specification, as accepted by the Contract Administrator, as computed from the reviewed Shop Drawings, excluding the mass of bar accessories.

E11.10.2 Install Reinforcing into Existing Concrete

(a) Installing reinforcing steel Into hardened concrete shall be paid for at the Contract Unit Price per unit for "Install Reinforcing Steel Into Hardened Concrete", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for performing all operations herein described and all other items incidental to the Work. This payment shall be made in addition to the mass of steel measured above.

E12. STRUCTURAL CONCRETE

E12.1 Description

(a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings.

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

E12.2 Referenced Specifications and Drawings

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

(i) ACI 309 – Guide for Consolidation of Concrete;

(ii) ACI 347 – Guide to Formwork for Concrete;

(iii) American Concrete Publication SP4 – Formwork for Concrete;

(iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;

(vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

(vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

(viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;

(ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;

(x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

(xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;

(xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;

(xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);

(xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);

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

(xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;

(xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(xix) CAN/CSA O121 – Douglas Fir Plywood;

(xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;

(xxi) CAN/CSA S269.1 – False Work for Construction Purposes;

(xxii) CAN/CSA S269.3 – Concrete Formwork;

(xxiii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

(xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and

(xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

E12.3 Scope of Work

(a) The Work under this Specification shall involve the following structural concrete Works:

(i) Bridge Sidewalk Slab Overlay Works:

(i) Bridge sidewalk slab Works shall comprise of the new cast-in-place concrete sidewalk slabs and curbs on top of the existing concrete sidewalk slab between transverse expansion joints.

(ii) Bridge Deck Slab Works:

(i) Bridge deck slab Works shall comprise of new cast-in-place concrete Bridge deck immediately adjacent to the traffic barriers on the Bridge deck.

(iii) Bridge Traffic Barrier Works:

(i) Bridge traffic barrier Works shall comprise of new cast-in-place concrete Bridge traffic and median barriers on the new Bridge deck, on the abutments, and on the approach slabs.

(iv) Expansion Joint Concrete Works:

(i) Expansion joint concrete Works shall comprise of the new cast-in-place concrete dams anchoring the expansion joints into the adjacent concrete Bridge deck and abutments, as specified in E15.7.4.

(v) Approach Slab Works:

(i) Approach slab Works shall comprise of the Work associated with the new cast-in-place concrete approach slabs. In addition, working base concrete beneath

the approach slabs shall be associated with this Work, including sidewalk and curb.

(vi) Roadway Expansion Slab Works:

(i) Roadway slab works shall comprise of the new cast-in-place concrete roadway expansion slabs at the ends of the Bridge, including sidewalk and curb.

(vii) Reinforced Roadway Slab Works:

(i) Roadway slab works shall comprise of the new cast-in-place concrete roadway slabs at the ends of the Bridge, including sidewalk and curb.

(viii) Abutment Modification Works:

(i) Abutment modification Works shall comprise of all new cast-in-place concrete modifications to the abutments.

(ix) Girder End Repairs

(i) Girder end repair Works shall comprise of all new cast-in-place concrete at the ends of the girders, to be completed prior to abutment modification works.

(x) Navigable Waters Protection Program

(i) All structural concrete Works shall satisfy the requirements of the Navigable Waters Protection Program. The permits are presently being finalized, but will be made available to the Contractor prior to commencement of the Work.

E12.4 Submittals

E12.4.1 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.

E12.4.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

(b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:

(i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;

(ii) Designated size, or sizes, of aggregates, and the gradation;

(iii) Aggregate source location(s);

(iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;

(v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;

(vi) The limits for slump;

(vii) The limits for air content; and

(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.

(d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

E12.4.3 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 (R_i) and fibre dispersion in accordance with the requirements of the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6, Section 15, Fibre Reinforced Structures, Clause 16.6. Testing for R_i of concrete shall be completed in accordance with E12.8.5(e).

(iii) Testing for air void system shall be completed in accordance with E12.8.5(c).

(iv) Testing for rapid chloride permeability shall be completed in accordance with E12.8.5(d).

(v) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) Aggregates

(i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least 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.

E12.4.4 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.

E12.4.5 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 false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(b) Design Requirements

(i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the precast concrete girders will not be accepted.

(iv) The loads and lateral pressures outlined in Part 3, Section 102 of ACI 347 and wind loads as specified by the Manitoba Building Code shall be used for

design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.

(v) As a minimum, the following spacings shall apply, for studding and waling:

- 20-mm plywood: studding 400 mm centre to centre (max.),
- Walers 760 mm centre to centre (max.)

(vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(vii) Formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(viii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.

(ix) Shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.

(x) Mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.

(xi) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

(xii) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.

(xiii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xiv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.

(c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. False work must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.

(d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E12.4.6 Screed for Deck Slab Concrete

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

E12.4.7 Concrete Deck Slab Pour Sequence and Schedule

(a) The Contractor shall submit to the Contract Administrator for review, at least ten (10) Business Days prior to the placement of concrete, details of the construction joints.

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

E12.5 Materials

E12.5.1 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.

E12.5.2 Handling and Storage of Materials

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

E12.5.3 Concrete

(a) Concrete materials susceptible to frost damage shall be protected from freezing.

(b) Concrete shall have nominal compressive strengths (f'_c) and meet the requirements for hardened concrete as specified in the following Table E12.1.

(c)

TABLE E12.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength MPa	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Minimum Post Residual Cracking Index
Type 1	Miscellaneous Repairs	35 @ 28 Days	C-1	1	20 mm	-	-
Type 2	Deck Slab, Sidewalk Slab Overlay, Traffic Barriers, Abutment Modifications, and Approach Slabs	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15

E12.5.4 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 the latest edition and all subsequent revisions of CAN/CSA A23.1, for Class S-1 exposure, except as follows

(i) 20 MPa at 28 days.

(c) Supplying and placing working base concrete shall be considered incidental to the Work and no separate payment will be made.

E12.5.5 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.

(iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

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

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12.

(c) Coarse Aggregate - Standard

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

(ii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.

(iii) Course aggregate when tested for abrasion in accordance with the requirements of the ASTM C131 shall not have a loss greater than 30%.

(iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E12.5.6 Admixtures

(a) Air-entraining admixtures shall conform to the requirements of ASTM C260.

(b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E12.5.7 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

(b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 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.

E12.5.8 Water

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

E12.5.9 Corrosion Inhibitor

(a) Corrosion inhibitor shall be MCI 2005 NS at a dosage of 1 L/m^3, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E12.5.10 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polylefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (R_i) and fibre dispersion in accordance to CHBDC CAN/CSA S6, “Fibre-Reinforced Structures”, Clause 16.6.

E12.5.11 Formwork

(a) Formwork materials shall conform to CAN/CSA A23.1, and American Concrete Publication SP4, “Formwork for Concrete.”

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CAN/CSA “O121”. Approved Manufacturers are “Evans” and “C-Z.”

(d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

(e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E12.5.12 Form Coating

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

E12.5.13 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. This formwork liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.

(b) Paper-lined forms shall be used on all soffit surfaces, such as 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.

E12.5.14 Curing Compound

(a) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.

(b) Type 2 shall only be used on surfaces of approach slabs, structural slabs, on surfaces that will not be exposed to view.

E12.5.15 Curing Blankets

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

E12.5.16 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

(i) The grout for bonding the 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:

(i) 1 part water;

(ii) 1 part latex bonding agent; and

(iii) 11/2 parts Type GUSF Portland cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E12.5.17 Epoxy Adhesive

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

E12.5.18 Epoxy Grout

(a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows

Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E12.5.19 Cementitious Grout

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

E12.5.20 Patching Mortar

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

E12.5.21 Flexible Joint Sealant

(a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E12.5.22 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E12.5.23 Precompressed Foam Joint Filler

(a) Precompressed expanding filler shall be “Emseal BEJS System”, satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(b) The sealant system shall be comprise of three components:

(i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated and highway-grade, fuel resistant silicone;

(ii) Field-applied epoxy adhesive primer; and

(iii) Field-injected silicone sealant bands.

E12.5.24 Low Density Styrofoam

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

E12.5.25 Backup Rod

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

E12.5.26 Screed Bases and Chairs

(a) Screed bases shall be Hilti HAS 304 stainless steel threaded rods, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(b) Screed chairs shall be Mega Screed as supplied by Brock White Canada Company, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E12.5.27 Dampproofing

(a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.

(c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable products are Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E12.5.28 Anchor Units for Aluminum Pedestrian Handrail

(a) Anchor units for the aluminum pedestrian handrail shall be Acrow-Richmond Type DGRS-1.

E12.5.29 Galvanized Steel Dowels and Expansion Sleeves for Bridge Traffic Barrier Expansion Assembly

(a) Dowels and expansion sleeves shall be fabricated in accordance with CAN/CSA G40.21, Grade 300W.

(b) The dowels shall be galvanized in accordance with CAN/CSA G164-M92, to a minimum net retention of 610 g/m^2.

(c) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(d) Approved products are:

(i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and

(ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E12.5.30 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, "Substitutes".

E12.5.31 Benchmark Plugs

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

E12.6 Equipment

E12.6.1 General

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

E12.6.2 Vibrators

(a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.

(b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel and stainless steel reinforcing, such as in locations that the existing deck reinforcing is exposed.

(c) The Contractor shall have standby vibrators available at all times during the pour.

E12.6.3 Placing and Finishing Equipment for Sidewalk Slab Overlay Concrete

(a) Placing Equipment

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

(b) Screed for Concrete Sidewalk Slab Overlay

(i) The Contractor may choose to use a mechanical or non-mechanical screed to strike the surface of the concrete sidewalk slab overlay.

(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 guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

(iv) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.

(v) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.

(vi) Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.

(vii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).

(viii) The supply, setup, operation, and takedown of the screed for concrete sidewalk slab overlay shall be considered incidental to the placement of the concrete sidewalk slab overlay. No separate measurement or payment shall be made for this Work.

E12.6.4 Placing and Finishing Equipment for Approach Slab Concrete

(a) Mechanical Screed for Approach Slab Concrete

(b) The mechanical screed shall be:

(i) Constructed to span the full width of the approach slab being placed;

(ii) Supported on screed rails positioned above the surface being screeded;

(iii) Sufficiently strong (truss type) to retain its shape under all working conditions, especially if any Work scaffolds are supported on the same screed rails;

(iv) The supply, setup, operation, and takedown of the movable mechanical screed shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.

(c) Movable Work Bridge for Approach Slab Concrete Works

(i) The Contractor shall provide a movable Work Bridge, spanning the approach slab at right angles to the centreline of roadway in order to facilitate a broom finish, the application of curing compound, the inspection of the freshly-placed concrete, and any remedial Work required to be done to the screeded surface, including filling in any holes left by the screed bars. After the surface has been screeded, all further Work that may be required shall be done from the Work Bridge.

(ii) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area, as required, for the purpose of providing safe access to the Work Bridge.

(iii) The supply, setup, operation, and takedown of the movable Work Bridge shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.

E12.7 Construction Methods

E12.7.1 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 for the texture of concrete the curing compound is being applied to.

E12.7.2 Temporary False Work, Formwork, and Shoring

(a) Construction Requirements

(i) Temporary false work, formwork, and shoring shall satisfy all requirements of the Navigable Waters Protection Program. The permits are presently being finalized, but will be made available to the Contractor prior to commencement of the Work.

(ii) The Contractor shall construct false work, formwork and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted Shop Drawings.

(iii) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted Shop Drawings.

(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 colour.

(g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

(h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and 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.

E12.7.3 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, E12.7.17, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E12.7.4 Sidewalk Slab Overlay Screeds

(a) Setting Sidewalk Slab Overlay Screeds

(i) The Contractor shall adjust screeds to the specified slab thickness. Adjust screed heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases shall be permitted to be drilled and grouted into existing concrete and shall be adjustable to achieve the required elevations.

(ii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E12.7.5 Concrete Bridge Traffic Barrier Joints

(a) Finishing of Concrete Barrier Joints

(i) The installation of the fibre joint filler, backup rod, and flexible joint sealant shall be completed following the application of the deck healer/sealer. Refer to E14, "Deck Healer/Sealer" for further details.

(ii) The installation of the fibre joint filler, the backup rod, and the flexible joint sealant shall be undertaken as shown on the Drawings.

(iii) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods. Polyethylene bond breaker tap shall be installed between joint fillers and sealants. Expansion board caps shall be adhered to fibre joint filler prior to closing barrier formwork. These caps shall be used to position and secure backup rod in place prior to flexible joint sealing operations.

(iv) The flexible joint sealant at the barrier joints shall be installed as per the Manufacturer's recommendations and shall be tooled smooth, after installation, to provide a clean, uniform finish and a properly sealed joint..

(v) The supply and installation of flexible joint sealant and fibre joint fillers shall be considered incidental to the Work, and no additional measurement or payment shall be made for this Work.

E12.7.6 Anchor Units for Aluminum Pedestrian Handrail

(a) All anchor units shall be installed as shown on the Drawings.

(b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.

(c) The Contractor shall coordinate the installation of aluminum pedestrian handrail posts as described in E16, "Aluminum Pedestrian Handrail".

E12.7.7 Galvanized Steel Dowels and Expansion Sleeves for the Bridge Traffic Barrier Expansion Joint Assembly

(a) All galvanized steel dowels and expansion sleeves shall be installed as shown on the Drawings.

(b) Each galvanized steel dowel and expansion sleeve shall be held in place securely by a wooden template during concrete placement operations.

(c) Expansion assemblies shall be installed in a sequential fashion into the concrete barrier panel cast first.

E12.7.8 Electrical Conduit

(a) The Contractor shall coordinate the installation of all conduits, pull boxes, and junction boxes for the lighting electrical embedded Work as described in E17 “Underbridge Light Fixtures”, and E21 “Electrical Conduits”.

(b) Construction of the abutment backwall, expansion joint blockouts, and approach sidewalk slabs require protection and coordination surrounding the live cables. Temporary power shutdown will be required for construction around these areas. Coordinate with Manitoba Hydro to make arrangements for safety watches and temporary power shutdown as required. Power shutdowns should be coordinated and minimized as much as possible. Refer also to E8.7.2 “Protection and Removal of Existing Electrical Cables and Conduits” and E21.7.3 “Conduits for Phase 2 Removals and Construction”.

E12.7.9 Permeable Formwork Liner

(a) Permeable formwork liner shall be used on all exposed surfaces, except on soffit surfaces, or surfaces where a normal an 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.

E12.7.10 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.

E12.7.11 Approach Slab Works

(a) The Contractor shall undertake the approach slab Works to the limits as shown on the Drawings. This shall also include the approach sidewalk and curb.

E12.7.12 Roadway Expansion Slab Works

(a) The Contractor shall undertake the reinforced roadway slab Works to the limits as shown on the Drawings. This shall also include the approach sidewalk and curb.

E12.7.13 Reinforced Roadway Slab Works

(a) The Contractor shall undertake the reinforced roadway slab Works to the limits as shown on the Drawings. This shall also include the approach sidewalk and curb.

E12.7.14 Abutment Modification Works

(a) Abutment modification Works include the modifications to the east and west abutment back wall, to the limits as shown on the Drawings.

(b) The abutment back wall shall not be reconstructed until the completion of girder end repairs.

(c) Application of Dampproofing

(i) Brush or spray primer on all surfaces, brushing into all corners. Apply two (2) coats of dampproofing allowing the first coat to dry before applying the second coat. Minimum application rate per coat shall be 0.6 L/m^2.

(ii) After application of the second coat, dampproofed areas shall be allowed to dry a minimum of forty-eight (48) hours prior to backfilling.

(d) The application of dampproofing shall be incidental to abutment modification Works.

E12.7.15 Girder End Repairs

(a) The Contractor shall undertake girder end repairs on the locations where girder end removals have taken place, as specified in E8 "Structural Removals". Girder end repairs shall take place in accordance with E13 "Repair Miscellaneous Areas of Concrete" and as specified on the Drawings.

(b) Concrete for girder end repairs shall be Type 1.

(c) Zinc DAS anodes shall be installed as specified on the Drawings and in accordance with E13 "Repair Miscellaneous Areas of Concrete". Payment of these anodes shall be in accordance with E13 "Repair Miscellaneous Areas of Concrete".

(d) Construction of the new abutment back wall shall not commence until completion of all girder end repairs.

E12.7.16 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 CAN/CSA A23.1, Clause 5.2, Production of Concrete.

(c) Time of Hauling

(i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.

(ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.

(iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.

(iv) Unless otherwise noted in Table E12.1, “Requirements for Hardened Concrete”, no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CAN/CSA A23.1 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers’ designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the 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:

i. Limit the amount to be placed at any time (using adequate construction joints);

ii. Augment his facilities and Plant in order to complete the proposed placement;

iii. In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and

(ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E12.7.17 Preparation for Concreting Against Hardened Concrete

(a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:

(i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.

(ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.

(iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

(iv) For the Bridge traffic and median barriers, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E12.7.18 Placing Structural Concrete

(a) General

(i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.

(b) Dry Run for Sidewalk Slab Overlay 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/m^2/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 CAN/CSA A23.1 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) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

(x) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

(xi) 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.

(xii) 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.

(xiii) 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.

(xiv) 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.

(xv) Before any concrete is placed for the approach slabs the Bridge deck slab or the sidewalk slab, the Contractor shall demonstrate to the satisfaction of the Contract Administrator before each pour that all necessary adjustments have been made to provide the required camber, crown, slab thickness, and concrete cover. This demonstration may be carried out by means of an attachment securely fastened to the finisher's strike-off machine and moving the machine and the strike-off across the deck over the reinforcing steel with a minimum 3 mm clearance between the steel and attachment.

E12.7.19 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 Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes, but excluding soffit surfaces where an architectural form finish is specified.

(ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

(iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.

(iv) The surfaces shall be patched as specified in this Specification.

(v) Finishing of barrier concrete shall be completed prior to the application of the deck healer/sealer. Refer to E14, “Deck Healer/Sealer” for further details.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces, with the exception of the approach slab concrete shall be finished as outlined hereinafter.

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish – Approach Slab Concrete

(i) After final floating, the slab surface shall receive coarse transverse scored texture by drawing a steel tined broom uniformly across the slab surface, to the satisfaction of the Contract Administrator.

(e) Type 4 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 E12.5.20

"Patching Mortar", E12.5.16 "Bonding Agents", and E12.7.22 "Patching of Formed Surfaces" of this Specification.

(ii) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E12.5.27, "Dampproofing" of this Specification.

(f) Working Base Concrete Finish

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

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

E12.7.20 General Curing Requirements

(a) Refer to E12.7.23, "Cold Weather Concreting" for cold weather curing requirements and E12.7.24, "Hot Weather Concreting" of this Specification for hot weather curing requirements.

(b) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of 24 hours. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.

(c) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.

(d) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.

(e) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

(f) Immediately following finishing of the sidewalk slab overlay concrete, apply fog misting until the concrete has enough strength to support the placement of the pre-dampened curing blankets. The misting device shall not be used to apply water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water. Failure to apply wet curing blankets within 40 minutes after the deck slab concrete has been deposited shall be cause for rejecting the Works so affected. Concrete in the rejected area shall be removed and replaced at no additional cost to the City.

(g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator. Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.

(h) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

(i) The sidewalk slab shall be moist cured in accordance with E12.7.20(e).

(j) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly and by roller.

(k) Where curing compound is permitted, and following the completion of finishing operations, the surface shall be sprayed with an initial coating of curing compound, as per the Manufacturer's recommendations. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

E12.7.21 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) 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.

E12.7.22 Patching of Formed Surfaces

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.

(b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.

(c) Patching of formed surfaces shall take place within 24 hours of formwork removal.

(d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.

(e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

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

E12.7.23 Cold Weather Concreting

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

E12.7.24 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 E12.2, “Acceptable Concrete Temperatures”, for the indicated size of the concrete section.

TABLE 12.2:
ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, M	TEMPERATURES °C	
	MINIMUM	MAXIMUM
Less than:		
1	10	27
1.2	5	25

E12.7.25 Cleanup

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

E12.8 Concrete Quality

E12.8.1 Inspection

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

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

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E12.8.2 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.

E12.8.3 Materials

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.

(c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.

(d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E12.8.4 Quality Assurance and Quality Control

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

(b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

(f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. An outline of the quality tests is indicated below.

E12.8.5 Concrete Testing

(a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E12.4.2, “Concrete Mix Design Requirements” of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E12.4.2, “Concrete Mix Design Requirements” of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(d) Rapid chloride permeability testing shall be performed in accordance with ASTM C1202.

(e) Testing for post-cracking residual strength index (R_i) 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 C1609-10. The average of the peak loads is the cracking load of the concrete (P_{cr}), 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 C1399-07. The average of the peak loads during the reloading is the post cracking load of the concrete (P_{pcr}). The R_i is equal to the ratio of P_{pcr} over P_{cr}. The Contractor shall submit a summary of the results of all post-cracking residual strength index tests, including all load defection curves. Tests conducted in accordance to ASTM C1399-07 will be considered invalid by the Engineer if the initial crack in the specimen has occurred after 0.5mm deflection. Specimens shall be sampled in accordance with E12.8.5(f).

(f) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method A23.2-1C, "Sampling Plastic Concrete".

(g) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".

(h) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

(i) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table E12.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E12.8.6 Corrective Action

(a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at 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.

E12.9 Measurement and Payment

E12.9.1 Structural Concrete

(a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(ii) Supply and Place Structural Concrete

(i) Sidewalk Slab Overlay;
(ii) Deck Slab;
(iii) Traffic Barriers;
(iv) Expansion Joint Dams;
(v) Approach Slabs;
(vi) Roadway Expansion Slabs;
(vii) Roadway Slabs; and
(viii) Abutment Modifications.

(c) 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.

E12.9.2 Structural Concrete

(a) Supplying and placing structural concrete shall be paid for at the Contract Unit Price per square metre for the “Items of Work” listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(iii) Girder Ends

(i) Partial Depth Repairs; and
(ii) Full Depth Repairs.

(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.

E12.9.3 Anchor Units for Pedestrian Handrail

(a) Supplying and installing anchor units for the Bridge street lights and pedestrian handrails shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Anchor Units for Pedestrian Handrail", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

E12.9.4 Galvanized Steel Bridge Traffic Barrier Expansion Joint Assembly

(a) Supplying and installing galvanized steel Bridge traffic barrier expansion joint assemblies shall be paid for at the Contract Unit Price per unit for "Supply and Install Galvanized Steel Bridge Traffic Barrier Expansion Joint Assembly", 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 performing all operations herein described and all other items incidental to the Work.

E13. REPAIR MISCELLANEOUS AREAS OF CONCRETE

E13.1 Description

(a) This Specification shall cover all operations relating to the repair of miscellaneous areas of Bridge deck, abutments, piers, deck fascia and soffit, historical art panels, and for supplying and installing zinc DAS anodes for girder end repairs, as specified herein and as shown on the Drawings.

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

E13.2 Reference Specifications and Drawings

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

(i) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

(ii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

(iii) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;

(iv) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

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

(vi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;

(vii) ICRI No. 03730 – Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion;

(viii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

(ix) ICRI Guideline No. 03737 – Guide for Selecting Application Methods for the Repair of Concrete Surfaces resulting from Reinforcing Steel Corrosion;

(x) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and

(xi) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

E13.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Repair of the existing deck slab concrete;

(ii) Repair and patching of pier concrete at existing light fixture locations;

(iii) Repair of miscellaneous abutment concrete;

(iv) Repair of miscellaneous deck fascia and soffit concrete; and

(v) Supply and install of zinc DAS anodes for girder end repair.

(b) Preparing and repairing concrete on other locations of deteriorated concrete as directed by the Contract Administrator.

E13.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the commencement of any Work on the Site, Shop Drawings showing the typical galvanic corrosion protection system installation details, such as distributed anode installation locations, type and location of anode standoff spacers, and reinforcing connections.

E13.5 Materials

E13.5.1 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.

E13.5.2 Handling and Storage of Materials

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

E13.5.3 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) 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 his own expense.

E13.5.4 Material for Concrete Repair

(a) General

(i) Concrete repair material may be either one or a combination of concrete repair mortars, conventional concrete.

(b) Concrete Repair Mortar

(i) The concrete repair mortar shall be a shrinkage compensated, fibre reinforced product suitable for application by hand trowelling, or spraying, or form and pour, or pump. The mortar product shall be EMACO S88 CI for trowelling or spraying or EMACO S66 CI for form and pour or pump by Masterbuilders or equivalent as approved by the Contract Administrator, in accordance with B7, "Substitutes". Mix in accordance with Manufacturer's Specifications, including addition of aggregate for deep repairs.

(c) Conventional Concrete

(i) Conventional concrete shall be in accordance with the requirements of Type 1 Concrete as specified in Table E12.1.

E13.5.5 Concrete Aggregate

(a) Concrete aggregate shall be in accordance with the requirements of Clauses E12.5.5(c).

E13.5.6 Admixtures

(a) Admixtures shall be in accordance with the requirements of Clause E12.5.6 or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.7 Cementitious Materials

(a) Cementitious Materials shall be in accordance with the requirements of Clause E12.5.7, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.8 Water

(a) Water shall be in accordance with the requirements Clause E12.5.8.

E13.5.9 Bonding Agent

(a) Bonding agents shall be in accordance with Clause E12.5.16 or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.10 Curing Compound

(a) If permitted for use, curing compounds shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.

(b) Type 2 shall only be used on surfaces of approach slabs, structural slabs, on surfaces that will not be exposed to view.

E13.5.11 Epoxy Adhesive

(a) Epoxy Adhesive shall be in accordance with the requirements of Clause E12.5.17, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.12 Permeable Formwork Liner

(a) Permeable formwork liner shall be "Hydroform", in accordance with the requirements of Clause E12.5.13, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.13 Galvashield XP Anodes for Miscellaneous Concrete Repairs

(a) Zinc anodes shall be Galvashield XP Anodes available from Vector Corrosion Technologies, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E13.5.14 Zinc DAS Anodes for Girder End Repairs

(a) Distributed galvanic units shall be alkali-activated zinc with nominal exterior dimensions of 28.5mm (1 1/8") diameter. The distributed anode unit shall consist of

0.89 kg of zinc per lineal meter of anode. The zinc anode shall be manufactured in compliance with ASTM B 418 Type II (Z13000) and ASTM B69 Rolled Special High Grade Zinc (Z13004) using zinc in compliance with ASTM B6 Special High Grade (Z13001) with iron content less than 15 ppm.

(b) The zinc shall be alkali-activated with a pH greater than 14. The anode unit shall contain no constituents that are corrosive to reinforcing steel as per ACI 222R such as chlorides, bromides, or other halides. The anode unit shall be supplied with a minimum of two lead wires of sufficient length to make connections between anodes and the reinforcing steel.

(c) The galvanic protection shall be Galvanode DAS distributed anode system supplied by:

Vector Corrosion Technologies
Winnipeg, MB
Phone: (204) 489-6300
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or approved by the Contract Administrator in accordance with B7, “Substitutes”.

E13.5.15 Concrete for Girder End Repairs

(a) Concrete for girder end repairs shall take place in accordance with E12.7.15. Payment for girder end repairs shall take place in accordance with E12.9(iii).

E13.6 Equipment

E13.6.1 General

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

E13.7 Construction Methods

E13.7.1 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.

E13.7.2 Preparation

(a) Remove all loose and deteriorated concrete to sound concrete from the surface of the abutment and girder concrete areas which are to receive new concrete.

(b) For partial and full depth repair, the deteriorated concrete shall be removed using a chipping hammer no heavier than 20 lbs, so as not to damage the reinforcing steel.

(c) Following the completion of concrete removals, the Contractor shall notify the Contract Administrator to inspect the Work. All resulting concrete and reinforcing steel surfaces shall be thoroughly cleaned by gritblasting. All gritblast materials shall be blown out of the repair area, cleaned up, and removed off and away from the Site.

(d) All rusted steel shall be chased until rust is not evident on reinforcing steel. Once the limits of each repair area is identified, saw cut a square perimeter around the patch to a minimum edge depth of 25 mm. Do not cut or damage existing reinforcing steel.

(e) Additional reinforcing steel, if required, shall be installed as directed by the Contract Administrator. Concrete shall be removed at least 50 mm behind all exposed rebar and more as required to fit in the anodes.

(f) If recommended by the mortar/grout Manufacturer's directions, pre-wet the patched surfaces for the duration recommended.

E13.7.3 Repair Miscellaneous Areas of Concrete

(a) Install zinc anodes, wired to the reinforcing steel, near the back of all patch areas, in accordance with the Manufacturer’s instructions, in locations as approved by the Contract Administrator.

(b) Minimum ambient air temperatures during repair work shall be 5°C.

(c) The surface temperature of the concrete and reinforcing steel shall be above 5°C during repair.

(d) Place concrete repair mortar or standard concrete if minimum formed dimensions permit.

(e) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates. This may be done by either the application of a suitable bonding agent or grout or by using a self-bonding mortar or concrete. Place mortar or concrete by trowelling, pumping, spraying, or into forms ensuring that all entrapped air is removed.

(f) The Contract Administrator shall inspect all repaired areas for bond using a hammer "sounding" method after form removal.

E13.7.4 General Curing

(a) Unformed concrete surfaces shall be covered and kept moist by means of wet curing blankets for seven (7) consecutive days immediately following finishing operations, or as otherwise approved by the Contract Administrator, and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter.

(b) After wet curing, a curing compound shall be applied at the rate of not less than 4 m^2/L. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

(c) Formed surfaces shall receive, immediately after stripping and patching, the same application of curing compound as finished surfaces.

(d) The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing.

(e) After completing the finishing of unformed surfaces, where curing compound is not permitted, the surfaces shall be promptly covered with a minimum of a single layer of clean, damp curing blanket and 6 mil polyethylene.

E13.7.5 Zinc DAS Anodes for Girder End Repairs

(a) The galvanic corrosion protection system shall consist of 450 mm long anodes. The anode units shall be connected to the existing reinforcing steel, in the locations shown on the Drawings. A minimum of 25 mm of clear concrete shall be placed over the anode units. After the anodes are installed and encased in concrete, the anodes will provide galvanic protection to the embedded steel at the interface of new and old concrete.

(b) The Contractor shall enlist and pay for a NACE-qualified Cathodic Protection Specialist employed by the activated zinc metalizing technology company to provide technical site support during the installation of the galvanic protection system. The Cathodic Protection Technician shall follow developed QA/QC procedures for the installation of the galvanic system approved by the Cathodic Protection Specialist.

(c) The Contractor shall coordinate its work with the designated Cathodic Protection Technician to allow for site support during project start-up and initial anode installation. The technician shall provide Contractor training and support for development of application procedures, QA/QC program, surface preparation, anode installation, reinforcing steel connection procedures, and verification of electrical continuity of embedded steel.

(d) Surface Preparation

(i) All spalled and delaminated concrete should be repaired using compatible repair materials in accordance with E8 “Structural Removals” and E13 “Repair of Miscellaneous Concrete” as shown on the Drawings.

(e) Reinforcing Steel Connections

(i) The Contractor shall directly connect each anode unit to exposed reinforcing steel tensioned strands and post tensioned ducts receiving corrosion protection.

(ii) Electrical connections to the reinforcing steel shall be established existing transverse reinforcing using incorporated tie wires at each end of the anode. Proposed electrical connection details shall be approved by the anode manufacturer and shall be detailed on the Shop Drawing submission.

(iii) The Contractor shall verify continuity between the connections and the reinforcing steel, post tensioned strands and duct prior to placing recess grout.

(f) Electrical Continuity

(i) Reinforcing steel shall be tested for electrically continuity. Maximum DC resistance shall be 1 ohm or maximum DC voltage shall be 1 mV. Steel found to be discontinuous shall have continuity re-established by tying to other bars with steel tie wire or other approved means.

(g) Galvanic Anodes

(i) Galvanic anode units shall be installed continuously along both sides of post tensioning duct as outlined on Drawings. The anodes shall be secured against reinforcing steel to prevent displacement during placing and consolidation of concrete. A minimum clearance between the existing concrete surface and the anode as sufficient to allow complete consolidation of the concrete around the anode shall be maintained.

(h) Concrete Placement

(i) Complete consolidation of grout between the anode and surrounding concrete should be maintained to ensure optimal anode performance.

E13.8 Quality Control

E13.8.1 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.

E13.8.2 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.

E13.9 Measurement and Payment

E13.9.1 Repair of Miscellaneous Areas of Concrete

(a) Repairing miscellaneous areas of concrete shall be paid for at the Contract Unit Price per square metre for “Repair Miscellaneous Areas of Concrete”, 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 performing all operations herein described and all other items incidental to the Work.

(b) Installation of Galvashield XP zinc anodes for miscellaneous concrete repairs shall be paid for at the Contract Unit Price per unit for “Supply and Install Galvashield XP Zinc Anode Units for Miscellaneous Areas of Concrete”, 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 performing all operations herein described and all other items incidental to the Work.

(c) Installation of Zinc DAS anodes XP zinc anodes for girder end repairs shall be paid for at the Contract Unit Price per unit for "Supply and Install Zinc DAS Anode Units for Girder End Repairs", 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 performing all operations herein described and all other items incidental to the Work.

E14. DECK HEALER/SEALER

E14.1 Description

(a) This Specification shall cover the supply application of the deck healer sealer on the deck slab traffic barrier concrete, as specified herein and shown on the Drawings.

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

E14.2 Referenced Specifications and Drawings

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

(i) ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by Plastic Sheet Method; and

(ii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays.

E14.3 ASTM D1149 – Standard Test Methods for Rubber Deterioration – Cracking in an Ozone Controlled Environment

E14.4 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the concrete surface of the existing and new deck slab and traffic barriers;

(ii) Applying the healer/sealer to the concrete deck slab and traffic barriers; and

(iii) Applying a broadcast aggregate to the wet, uncured resin.

E14.5 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any Work on Site, a copy of current test results from a certified laboratory including conformance of the product to Specifications, and one (1) sample of the product that will be supplied during the Contract.

E14.6 Materials

E14.6.1 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

E14.6.2 Crack Healer/Sealer

(a) The crack healer/sealer shall be a very low viscosity high molecular weight methacrylate resin or a very low viscosity reactive methacrylate resin.

(b) Approved products are Degadeck Crack Sealer Plus by BASF, X-Shield DeckSealer AT by X-Calibur, and TK-2414 by TK Products.

E14.6.3 Broadcast Aggregates

(a) Aggregate for broadcasting onto the uncured resin shall be dry silica sand and of a grit size recommended by the resin Manufacturer for the application of their product.

E14.7 Construction Methods

E14.7.1 Curing of Deck Slab and Traffic Barrier Concrete

(a) The deck slab and traffic barrier concrete shall cure a minimum of twenty-eight (28) days prior, or as recommended by the resin Manufacturer, to commencing surface preparation for the application of the deck healer/sealer.

E14.7.2 Surface Preparation

(a) Immediately prior to commencing application of the deck healer/sealer, the concrete deck slab surface, including the repair areas and new deck slab concrete, over which the wearing surface is to be applied, shall be thoroughly shot-blasted to remove all surface laitance, dirt, oil, grease, curing compound, existing membranes or protective coatings including previously applied wearing surfaces, or other deleterious material. Surface preparation shall achieve a “Light Shotblast” profile, in accordance with the ICRI Guideline No. 03732, CSP3.

(b) The prepared surface shall be free of all dirt, moisture, or other contaminants immediately prior to installation of the wearing surface. Reshot-blasting shall be required in the event of rain, delay in applying the wearing surface, or leakage of oil or other contaminants on the prepared surface. The face of the concrete traffic barriers shall also undergo this surface preparation to a height of 100 mm above the deck slab surface.

(c) The Contractor shall complete all patching of the traffic barrier concrete for locations where the deck healer/sealer is to be applied. All barrier joint reveals shall be thoroughly cleaned by methods of sandblasting to the satisfaction of the Contract Administrator. Caulking of the joints between the bridge deck and traffic barriers shall be installed following the application of the deck healer/sealer.

(d) Only the area inaccessible for shot-blasting, including the 100 mm vertical face of the concrete traffic barriers, shall be prepared by very heavy sandblasting to remove all laitance and to expose the coarse aggregate in the substrate concrete to achieve a CSP3 profile.

E14.7.3 Weather Conditions, Dryness of Concrete Substrate and Polymer Layers

(a) The Work of this Contract shall be done in suitable conditions of temperature, wind, dust, and moisture. If weather factors or moisture conditions of the substrate concrete are detrimental to the acceptable placement of the overlay, the Work shall be suspended until suitable conditions exist. Mixing, placing and curing of healer/sealer shall be done at ambient air and substrate concrete temperatures between 5°C and 30°C. The Contract Administrator’s decision on the suitability of weather conditions shall be final.

(b) The concrete substrate, including concrete patching and repairs shall be completely dry before application of the healer/sealer. Presence of moisture will be determined by the modified ASTM D4263. This test shall be carried out on the concrete substrate as well as on previous placed polymer overlays. The Contractor shall place a

minimum of four (4) test windows, per application area, at different time periods. The test windows shall consist of three (3) layers of clear and one (1) layer of black heavy duty six (6) μm poly, 1000mm x 500 mm located in moisture prone areas. The test windows shall be heated at a temperature of 55°C continuously for a time period of six (6) hours for each test and at a time duration, period and frequency of test, as determined by the Contract Administrator. Timing of the test windows shall not start until the temperature of the concrete surface has reached 55°C. This will not relieve the Contractor from his responsibility to ensure that the overlay does not de-bond. The Contractor shall provide four (4), 500 watt halogen lamps and a portable electric generator (3500 watt) and carry out required testing which will be considered incidental to the Contract and no separate or additional payment will be made.

E14.7.4 Application of Healer/Sealer

(a) The healer/sealer and aggregate shall be applied in accordance to the resin Manufacturer's instructions.

(b) Ensure that full curing of the resin is complete prior to allowing traffic to concrete deck surface.

E14.8 Quality Control

E14.8.1 General

(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.

E14.8.2 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.

E14.8.3 Testing

(a) The Contract Administrator may have the sample of the product tested for conformance to the specified products.

E14.8.4 Corrective Action

(a) Failure to comply strictly with the resin Manufacturer's instructions regarding storage, mixing, application methods, weather conditions, timing, or other instructions will result in rejection, removal, and replacement of the Work by the Contractor at the Contractor's expense. Similarly, any delay in spreading the healer/sealer on the deck or in seeding the aggregates, failure to consider wind, rain, temperature conditions, or other improper workmanship resulting in a non-uniform distribution of aggregates or segregation of aggregates in the overlay or unsatisfactory roughness will result in rejection of the Work.

E14.9 Measurement and Payment

E14.9.1 Deck Healer/Sealer

(a) Supply and installation on the healer/sealer for the bridge deck will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Deck Healer/Sealer, 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 performing all operations herein described and all other items incidental to the Work.

E15. EXPANSION JOINTS

E15.1 Description

(a) This Specification shall cover the supply and installation of expansion joints and miscellaneous steel items, as specified herein and shown on the Drawings.

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

E15.2 Referenced Specifications and Drawings

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

(i) ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;

(ii) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(iii) ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension;

(iv) ASTM D471 – Standard Test Method for Rubber Property – Effect of Liquids;

(v) ASTM D573 – Standard Test Method for Rubber – Deterioration in an Air Oven;

(vi) ASTM D1149 – Standard Test Methods for Rubber Deterioration – Cracking in an Ozone Controlled Environment;

(vii) ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness;

(viii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(ix) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding);

(x) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles; and

(xi) Ontario Provincial Standard Specification OPSS 1210 – Material Specification for Deck Joint Assemblies.

E15.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the transverse expansion joints;

(ii) Supplying and installing the longitudinal expansion joint;

(iii) Casting concrete for the expansion joint dams;

(iv) Supplying and installing the expansion joint seals;

(v) Completing a watertight verification of the expansion joint seals;

(vi) Supply and installing the expansion joint cover plates and other miscellaneous steel items; and

(vii) Seal welding the flange of the expansion joint edge members to the corner plates.

E15.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the

proposed Shop Drawings showing all fabrication details and any proposed field splice details of the steel components of the expansion joints. The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall also be responsible for the expansion joint installation procedure.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

E15.5 Materials

E15.5.1 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.

E15.5.2 Handling and Storage of Materials

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

(b) Store materials under cover in a dry and clean location off the ground.

E15.5.3 Modular Expansion Joints

(a) Expansion joints shall be of a modular type where and as shown on the Drawings.

(b) The modular expansion joints shall be Wabo Modular Joint System “D-300” box seal system, as specified in the Drawings, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(c) Expansion joints shall have fabricated cover plates and slider plates as shown on the Drawings.

(d) The seals at each joint shall be made out of neoprene, as accepted by the Contract Administrator and shall be supplied in one continuous piece, separate from the steel extrusions or joint. No shop or field splicing will be allowed in the seals.

(e) All fasteners and hardware of the modular bridge deck expansion joints shall be Grade 316, stainless steel.

E15.5.4 Longitudinal Expansion Joint

(a) Expansion joint shall be the Wabo Jeene joint system, as specified in the Drawings, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(b) The longitudinal expansion joint shall have fabricated cover plates and slider plates as shown on the Drawings.

(c) The seal shall be made out of neoprene, as accepted by the Contract Administrator and shall be supplied in one continuous piece, separate from the steel extrusions or joint. No shop or field splicing will be allowed in the seals.

(d) All fasteners and hardware of the modular bridge deck expansion joints shall be Grade 316, stainless steel.

E15.5.5 Steel

(a) Steel supplied for the fabrication of the bridge deck expansion joints shall conform to the requirements of CAN/CSA G40.21, Grade 300W, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. They shall be galvanized after shop fabrication in accordance with CAN/CSA G164-M92 to a minimum net retention of 610 g/m^2.

E15.5.6 Steel Extrusions

(a) Steel for the extrusions shall conform to the requirements of CAN/CSA G40.21, Grade 230G minimum.

E15.5.7 Anchor Studs

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

E15.5.8 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/m^2.

(b) The sidewalk cover plate shall be coated with approved non-slip grit paint.

E15.5.9 Galvanizing Touch-up and Field Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(b) Approved products are:

(i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and

(ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E15.5.10 Welding

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

E15.5.11 Preformed Neoprene Joint Seals

(a) Further to E15.5.3(d), the preformed neoprene expansion joint seals shall be manufactured from a vulcanized elastomeric compound using crystallization resistant polychoroprene (neoprene) as the only polymer.

(b) The preformed neoprene expansion joint seals shall meet the requirements of the latest edition and all subsequent revisions of Ontario Provincial Standard Specification (OPSS) 1210 "Material Specification for Preformed Neoprene Joint Seals", and as amended herein; and of Table E15.1 of this Specification. All tests will be made on specimens prepared from the extruded seals.

E15.5.12 Epoxy Adhesive

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

E15.5.13 Epoxy Grout

(a) Where epoxy grout is used, it shall be Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, Duralcrete, Dural 103 Gel, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E15.5.14 Cementitious Grout

(a) Cementitous grout shall be nonshrink and nonmetalic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in

accordance with B7, “Substitutes”. The minimum compressive strength of the grout at 28 days shall be 40 MPa

E15.6 Equipment

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

E15.7 Construction Methods

E15.7.1 Fabrication

(b) No fabrication shall commence until acceptance of the Shop Drawings from the Contract Administrator has been obtained.

(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 units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall and skew, as well as accurate positioning and alignment of supporting brackets. The Contractor shall exercise care in the handling of all units during shipping and loading operations prevent twists, bends, and warping.

(d) Matching expansion joint assemblies shall be assembled and bolted together for shipping.

(e) Expansion joint assemblies shall be shop checked for fit and match marked.

(f) 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.

(g) In no case shall weldments be substituted for extrusion shapes.

(h) 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.

(i) The colour of the galvanizing shall be consistent and continuous.

E15.7.2 Installation

(a) Expansion joints shall be installed in two construction phases.

(b) The Contractor shall install expansion joints 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. One field splice in the length of the expansion joint is permitted.

(c) The edges of the expansion joint cover plates shall be seal welded to the expansion joint cover plates as shown on the Drawings.

E15.7.3 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 receive field-applied 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. 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.

(c) The process is to be repeated as required to achieve a thickness comparable to original galvanizing, as approved by the Contract Administrator.

E15.7.4 Placement of Concrete at Expansion Joints

(a) The expansion joint assemblies shall be set in position, and secured rigidly in place, such that they will remain true to line and elevation during and after concreting, in accordance with approved details as shown on the Shop Drawings.

(b) Care shall be taken during consolidation of the concrete to ensure that there are no voids in the concrete under and around the expansion joint components and associated reinforcing steel.

(c) Before concreting, the expansion joint opening shall be set to give the correct width for the mean concrete temperature of the deck. The gap width shall be obtained from the Temperature Width Adjustment Table provided on the Drawings, as approved on-site by the Contract Administrator immediately prior to the start of concrete placement.

(d) Immediately in front of concrete placement at the expansion joints, all metal contact surfaces between the expansion joint and concrete shall be coated with epoxy adhesive.

(e) After the concrete has set for seventy-two (72) hours, and after the removal of the Manufacturer's temporary clamping channels, epoxy grout shall be used to fill any associated bolt holes

E15.7.5 Field Welding and Touch-Up Galvanizing

(a) Prior to installation of the seals, the flange of the expansion joint edge members shall be vulcanized or seal welded to the corner plates, as shown on the Drawings, to provide watertight joints.

(b) Any areas of damaged galvanizing or metallizing on miscellaneous steel items shall receive field-applied touch-up galvanizing, in accordance with ASTM A780.

(c) 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. 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.

E15.7.6 Installation of Seal

(a) A permanent seal at each expansion joint unit shall be installed as one continuous piece after completion of all concreting operations, to the satisfaction of the Contract Administrator.

(b) Only upon completion of all concrete cleanup operations shall the Contractor open up the seating areas and prepare them for them installation of the seals.

(c) The installation of the expansion joint seal will be completed according to the construction phasing, as detailed on the Drawings.

E15.7.7 Watertight Verification of Expansion Joint and Concrete Blockouts

(a) Prior to installing the expansion joint cover plates, the Contractor shall dyke off the bridge deck expansion joints and maintain a minimum of 75 mm of water over all areas of the seal for a period of not less than four (4) hours, with no leakage. This shall also include verification of leakage between the steel edge angles and the concrete blockout. Any and all leaks shall be corrected, using mechanical or other adjustment of the bridge deck 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 joints 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 pier tops for inspection of the expansion joints during the testing.

E15.7.8 Installation of Expansion Joint Cover Plates on the Concrete Bridge Traffic Barriers, Bridge Sidewalk Slab, and Bridge Sidewalk Curbs

(a) Perform cutting, drilling, and fitting required for installation of expansion joint cover assemblies. Touch-up galvanizing shall be completed in accordance with E15.7.5, “Field Welding and Touch-Up Galvanizing”.

(b) Install joint cover assemblies in true alignment and proper relationship to the opening of the expansion joint and adjoining finished surfaces measured from the established lines and levels.

(c) Allow for thermal expansion and contraction of metal to avoid buckling.

(d) Set floor covers at elevations flush with adjacent finished floor materials unless otherwise shown.

(e) Locate wall, ceiling, and overhang covers in continuous contact with adjacent surfaces. Securely attach in place using required accessories. Make allowances for change in joint size due for installation.

(f) Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.

E15.8 Fabrication Warranty

(a) Before final acceptance of the expansion joints by the Contract Administrator, the bridge deck expansion joints supplier shall provide the City with a written warranty 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 issuance of the Certificate of Acceptance (Certificate of Acceptance is issued after the successful completion by the Contractor of the Project's standard warranty period), 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 expansion joints, including removal of the defective expansion joint assemblies and supply and installation of the replacement expansion joint, at no cost to the City, 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 issuance of the Certificate of Acceptance.

E15.9 Installation Warranty

(a) The Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication warranty.

(b) Similar to the expansion joint Supplier, and before final acceptance by the Contract Administrator, the Contractor shall warranty, in writing, the performance of the expansion joints and concrete expansion joint blockouts for a period of five (5) years from the date of issuance of the Certificate of Acceptance (Certificate of Acceptance is issued after the successful completion by the Contractor of the Project's standard warranty period). Provide in the warranty for the replacement of the expansion joints at no cost to the City, including all direct and indirect costs in the event that 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 issuance of the Certificate of Acceptance.

E15.10 Quality Control

E15.10.1 General

(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.

E15.10.2 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.

E15.10.3 Expansion Joint Seal Markings

(a) All expansion joint seals 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 seals produced by the respective Manufacturer. The seal shall also be permanently marked, on the side of the seal, with the date of production and the batch/lot, at intervals of not more than 1.2 m.

(b) The Contractor shall supply to the Contract Administrator a summary of the seals identifying the date of manufacture, the batch/lot, and the proposed installation location.

E15.10.4 Joint Seal Samples and Testing Procedures

(a) The Contractor shall supply seal sample material at no charge to The City for quality control testing purposes. The samples will each be 1.5 m long. Each sample will represent not more than three expansion joint seals of the same size, lot, and make and shall be continuous with same until sampled by the Contract Administrator. As soon as the seals to be used in the joint assemblies 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 E15.1, “Physical Requirements”.

(c) All materials failing to meet the Specification requirements will be rejected.

(d) Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

Table E15.1: Physical Requirements

Property	Physical Requirements	Test Procedure*
1. Tensile Strength	Minimum 13.5 MPa	ASTM D412 OPSS 1210.07.03.01.02
2. Elongation at Break	Minimum 250%	ASTM D412 OPSS 1210.07.03.01.02
3. Hardness, Type A Durometer	55: +7 Points -5 Points	ASTM D2240 OPSS 120.07.03.01.03
4. Oven aging Test 70 Hours at 100°C Reduction in Tensile Strength Reduction in Elongation Increase in Hardness	Maximum 20% Maximum 20% Maximum 10 Points	ASTM D573
5. Permanent Set at Break	Maximum 10%	ASTM D412

Property	Physical Requirements	Test Procedure*
6. Low Temperature Stiffening Hardness, Type A Durometer	Maximum 15 Points	ASTM D2240 OPSS 1210.07.03.01.03
7. Oil Swell, ASTM Oil No. 3 70 H at 40°C (wipe with toluene to remove surface contamination)	45 max	ASTM D471
8. Ozone Resistance	No Cracks	ASTM D1149
9. **Safe Compressibility Test (Z min.) Bridge Seal - < 63.5 mm > 63.5 mm	 Minimum 50% Minimum 55%	OPSS 1210.07.03.01.04
10. **Pressure Generation at 15% Deflection	Minimum 20 kPa	OPSS 1210.07.03.01.04
11. **Recovery 22 h at -28°C 70 h at -10°C 70 h at + 100°C	Minimum 80% No Cracking Minimum 88% Splitting or Minimum 85% Sticking	OPSS 1210.07.03.01.05

* ASTM - American Society for Testing and Materials
OPSS - Ontario Provincial Standard Specification
** This physical requirement not applicable to lock-in type joint seals

E15.11 Measurement and Payment

E15.11.1 Expansion Joints

(a) Supplying and installing expansion joints shall be measured on a unit basis. This item of Work shall be paid for at the Contract Unit Price per unit for "Supply and Install Expansion Joints", 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 performing all operations herein described and all other items incidental to the Work.

E16. ALUMINUM PEDESTRIAN HANDRAIL

E16.1 Description

(a) This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail as specified herein and as shown on the Drawings.

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

E16.2 Referenced Specifications and Drawings

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

(i) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

(ii) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;

(iii) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

(iv) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;

(v) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;

(vi) CAN/CSA W59.2 – Welded Aluminum Construction; and

(vii) CAN/CSA S157 – Strength Design in Aluminum.

E16.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the aluminum pedestrian handrail; and

(ii) Supplying and installing miscellaneous steel items and other items associated with the Work.

E16.4 Submittals

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

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

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in E16.8, "Quality Control" and mill certificates.

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

(i) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

(ii) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

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

E16.5 Materials

E16.5.1 General

(a) This Specification shall cover all operations relating to the repair of miscellaneous areas of abutment Bridge deck and precast concrete girder concrete, as specified herein and as shown on the Drawings.

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

E16.5.2 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.

E16.5.3 Material for the Aluminum Pedestrian Handrail

(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.

E16.5.4 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.

E16.5.5 Handrail Anchorage System

(a) The handrail anchorage system is specified and paid for in accordance with E12, “Structural Concrete”.

E16.5.6 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.

E16.5.7 Aluminum Filler Alloys for Welded Construction

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

E16.5.8 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”.

E16.6 Equipment

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

E16.7 Construction Methods

E16.7.1 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.

E16.7.2 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 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 one completely fabricated handrail sample panel, including at least two 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 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:

(iv) Guided Bend Test: All bend tests should be fully guided through an angle of 1800. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.

(v) 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.

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

(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 7 percent greater than the nominal diameter of the fastener, except:

(iii) Slotted holes for expansion purposes shall be provided as required on the Drawings

(iv) 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.

(v) 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.

(vi) 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.

E16.7.3 Installation of Aluminum Pedestrian Handrail

(a) The aluminum pedestrian handrail 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.

E16.8 Quality Control

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

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

E16.8.2 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.

E16.8.3 Testing

(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.

E16.9 Measurement and Payment

E16.9.1 Aluminum Pedestrian Handrail

(a) Supplying and Installing the aluminum pedestrian handrail shall be paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Pedestrian Handrail", 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.

E17. REMOVAL, SALVAGE, AND REINSTALLATION OF ALUMINUM BALANCED BARRIER

E17.1 Description

(a) This Specification covers the removal and salvage of the existing aluminum balanced barrier on Portage Avenue at the east and west ends of the North and South structures. Also included are the removal, salvage, and reinstallation of the aluminum balanced barrier at various locations adjacent to the roadway, as shown on the Drawings.

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

E17.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Removing the existing aluminum balanced barrier from the four corners of the Bridge;

(ii) Salvaging all aluminum balanced barrier components;

(iii) Reinstalling the aluminum balanced barrier at the four corners of the Bridge, as shown on the Drawings;

(iv) Creating an inventory of salvaged materials to be returned to the City's Bridge Yard; and

(v) Transporting and loading salvaged aluminum balanced barrier materials to the City's Bridge Yard.

E17.3 Referenced Specifications and Drawings

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

(i) CW 3650 – Installation of Aluminum Balanced Barrier

E17.4 Materials

E17.4.1 General

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

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

E17.4.2 Handling and Storage of Materials

(a) All material shall be handled and stored in a careful and workmanlike manner, in accordance with Section 5.2 of CW 3650, to the satisfaction of the Contract Administrator.

(b) Any damaged or missing material components resulting from handling and storage operations shall be replaced at the Contractor's expense, to the satisfaction of the Contract Administrator.

(c) All aluminum balanced barrier rail and posts shall be stored on wood blocking and shall not be stored directly on the ground. The barrier components to be salvaged and returned to the City shall be transported on wood blocking and shall be secured to prevent movement, which may cause damage during transportation.

(d) The Contractor shall provide equipment at the City Bridge Yard for unloading and placement of the material at the location directed by City personnel.

E17.4.3 Balanced Barrier Components

(a) All components shall be in accordance with Section 5.4 of CW 3650 and in accordance with the Drawings.

(b) Salvaged barrier railing, splice bars, and clamp bars deemed to be in good condition based on the pre-removal inspection shall be used for reinstallation.

(c) Splice bars and clamp bars with cap screws broken into them due to the Contractor's removal operation shall be considered in good condition. The Contractor has the option to drill out and re-top the holes or replace with new material at his expense.

(d) Salvage barrier posts deemed to be in good condition, following removal and cleaning, shall be used for reinstallation.

(e) Should there not be sufficient salvaged material in good condition available on site, the Contractor shall supply additional barrier railing, splice bars, clamp bars, and barrier posts.

(f) Miscellaneous hardware including stainless steel cap screws and washers shall be supplied new by the Contractor.

(g) Splice bars, as detailed on the Drawings, shall be supplied new by the Contractor.

E17.4.4 Granular Backfill Material

(a) Granular backfill material shall conform to the requirements of Section 5.5 of CW 3650. Crushed limestone base course shall not be permitted for use.

E17.4.5 Alkali-Resistant Bituminous Paint

(a) Alkali resistant bituminous paint shall conform to the requirements of Section 5.6 of CW 3650.

E17.4.6 Miscellaneous Materials

(a) The Contractor shall supply all required miscellaneous materials, as approved by the Contract Administrator, to facilitate the salvaging and reinstallation of the aluminum balanced barrier.

E17.5 Equipment

E17.5.1 General

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

E17.6 Construction Methods

E17.6.1 Pre-Removal Inspection

(a) Prior to the removal and dismantling of the aluminum balanced barrier, the Contractor and Contract Administrator shall jointly inspect the barrier to take note of any damage above ground level, and to determine which components cannot be used for reinstallation.

(b) The layout and location of the barrier posts, railing, and rail splices shall be recorded by the Contractor for locations requiring reinstallation. Generally, the barrier rail splice location for top and bottom rails shall be staggered at alternate post locations, 300 mm past the barrier post in the direction of the adjacent traffic. If the existing installations do not conform to this layout, the Contract Administrator will provide a revised layout prior to reinstallation. Additional rails, posts, splice bars, and clamp

bars required due to the revised layout will be supplied by the Contractor if sufficient salvaged material is not available on site.

E17.6.2 Inspection and Preparation of Barrier Posts

(a) After the barrier posts are removed, all posts shall be thoroughly cleaned by mechanical scrubbing and power washing, to the satisfaction of the Contract Administrator.

(b) The Contract Administrator will inspect the cleaned posts and determine the ones that can be used for reinstallation.

(c) All posts that will be reinstalled shall be recoated with alkali resistant bituminous paint in accordance with Section 9.4 of CW 3650.

E17.6.3 Installation of Balanced Aluminum Barrier

(a) After removal of rails, all rails shall be cleaned by mechanical scrubbing and power washing, to the satisfaction of the Contract Administrator.

(b) The installation of the balanced aluminum barrier shall be at the locations shown on the Drawings based on layouts approved or provided by the Contract Administrator.

(c) The installation and acceptance of the barrier shall be in accordance with Section 9 of CW 3650.

E17.6.4 Salvaging of Existing Guardrail

(b) Further to Section 9.6 of CW 3650, all surplus salvaged material shall be delivered to:
City of Winnipeg Public Works Bridge Yard
849 Ravelston Ave. W.
Phone: (204) 794-8510
Contact: Mr. Mike Terleski, C.E.T.

(a) A minimum of forty-eight (48) hours' notice is required prior to delivery of the salvaged materials. Once the barriers have reached the Site, they shall be carefully unloaded, placed, and assembled at the locations shown on the Drawings

(b) Further to Section 5.2 of CW 3650, the salvage material shall be properly placed in the bridge yard at the location determined by City personnel in a manner accepted by the City.

(c) Salvaged material deemed unsuitable for reinstallation shall also be returned to the City Bridge yard.

(d) Prior to delivery, splice bars and clamp bars shall be removed from the aluminum balanced barrier rail.

(e) Broken cap screws, splice bars, and clamp bars, where not required for reuse do not need to be returned to the City Bridge yard.

E17.7 Quality Control

E17.7.1 Inspection

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

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

E17.7.2 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.

E17.8 Measurement and Payment

(a) Remove, Salvage, and Reinstallation of aluminum balanced barrier will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3650

E18. PAINTING OF CONCRETE SURFACES

E18.1 Description

(a) This Specification shall cover all operations relating to the painting of the concrete abutments, piers, and historical concrete panels.

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

E18.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Removing existing paint and cleaning existing concrete surface;

(ii) Preparing existing concrete surfaces to receive paint; and

(iii) Painting concrete piers and historical concrete panels.

E18.3 Submittals

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

E18.4 Materials

E18.4.1 General

(a) This Specification shall cover all operations relating to the repair of miscellaneous areas of abutment Bridge deck and precast concrete girder concrete, as specified herein and as shown on the Drawings.

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

E18.4.2 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.

E18.4.3 Paint for Concrete Surfaces

(a) Paint for concrete abutments shall be Ultra Exterior Flat Latex by Glidden Paint, colour to be determined to match the existing concrete surface, or approved equal in accordance with B7, "Substitutes".

E18.5 Construction Methods

E18.5.1 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.

E18.5.2 Clean and Repaint Exterior Pier, Abutment, and Historical Panel Concrete

(a) The Contract Administrator shall mark out all areas where painting is to be completed.

(b) Pressure wash existing concrete surfaces to be repainted.

(c) Lightly sandblast concrete surfaces to remove all old, cracked or peeled paint, loose chalky paint, dirt, and other foreign material.

(d) Apply paint using brush, air spray, or roller. Spread evenly and work thoroughly in to all seasoning cracks, corners, and recesses.

(e) Apply the first coat of paint and allow it to dry.

(f) Putty flush with the surface, all cracks, checks, nail holes, or other depressions and allow the surface to dry.

(g) Apply the second coat and allow it to dry.

(h) Apply paint only at an ambient temperature of 10°C or above

E18.6 Quality Control

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

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

E18.6.2 Access

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

E18.6.3 Testing

(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.

E18.7 Measurement and Payment

E18.7.1 Painting of Concrete Surfaces

(a) Painting of concrete surfaces shall be paid for at the Contract Unit Price per square metre for “Painting of Concrete Surfaces”, 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.

E19. GROUTED RIPRAP

E19.1 Description

(a) Further to the latest version of the City of Winnipeg Standard Construction Specification CW 3615, this Specification shall cover all grouted riprap operations on the abutment headslopes.

E19.2 Referenced Specifications and Drawings

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

(i) CW 3615 – Riprap

E19.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Replacing grouted riprap which has been damaged by structural removal of the abutments; and

(ii) Removing and replacing miscellaneous areas of grouted riprap within the Limits of Construction.

E19.4 Materials

E19.4.1 General

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

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

(c) Materials shall be as specified in CW 3615.

E19.5 Equipment

E19.5.1 General

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

E19.6 Construction Methods

E19.6.1 General

(a) Grouted riprap shall be installed in locations that have been damaged by structural removal operations. The Contract Administrator shall identify all areas requiring replacement. Remove existing grouted riprap and replace with new grouted riprap.

(b) The Contract Administrator shall identify other miscellaneous areas of grouted riprap repair within the Limits of Construction.

E19.7 Quality Control

E19.7.1 Inspection

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

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

E19.7.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E19.8 Measurement and Payment

E19.8.1 Grouted Riprap

(a) Grouted riprap, including the removing of existing grouted riprap, will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3615.

E20. UNDERBRIDGE LIGHT FIXTURES

E20.1 Description

(a) This Specification shall cover the replacement of underbridge light fixtures at the piers on each side of Sturgeon Creek.

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

E20.2 Referenced Specifications and Drawings

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

(i) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(ii) CAN/CSA C22.1 – Canadian Electrical Code Part 1;

(iii) CAN/CSA C22.2 – Information Technology Equipment - Safety - Part 1: General Requirements; and

(iv) CAN/CSA C22.3 – Electrical Conduit.

(v) Manitoba addendums and revisions to C22.1

(vi) Ctiy of Winnipeg Electrical Bylaws.

E20.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Replacing the fixtures for the underbridge lights as shown on the Drawings.

E20.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the schedule commencement of fabrication, the proposed Shop Drawings showing all fabrication details for electrical components. Fabrication shall take place as shown on the Drawings.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

E20.5 Materials

E20.5.1 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.

(c) Materials shall be CSA Certified.

E20.5.2 Light Fixtures for Underbridge Lighting

(a) Light fixtures for underbridge lighting to be as specified in the luminaire schedule on the Drawings. Fixtures to be complete with lamps.

(b) HID ballasts to be integral with luminaires, 120V +/-10%, totally enclosed, suitable for ambient temperature ranging from +40°C to -40°C, minimum 95% power factor with 95% of rated lumens.

E20.5.3 Conduits and Related Materials

(a) All conduits shall be as shown on the Drawings or otherwise accepted by the Contract Administrator, in accordance with the Canadian Electrical Code, unless otherwise specified.

(b) Install polypropylene fish wire in all conduits.

(c) All conduits, pull boxes and junction boxes for the electrical work embedded in concrete or exposed inside girders and abutments shall be Rigid PVC (polyvinyl chloride) conforming to the requirements of CAN/CSA C22.2 No. 136. Exposed conduits on the Bridge exterior shall be Rigid Galvanized Steel.

(d) All covers for boxes shall be stainless steel and fastened with stainless steel vandal-proof screws.

(e) Flexible couplings shall be such as Crouse-Hinds Type EC or equal accepted by Contract Administrator.

(f) Pressure type wire connectors shall conform to the requirements of CAN/CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

E20.5.4 Touch-Up and Field Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(b) Approved products are:

(i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and

(ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

(c) All fasteners, including bolts, nuts, washers, concrete anchors/inserts, etc., shall be as shown on the Drawings and shall be stainless steel.

E20.5.5 Wiring Terminations

(a) Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

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.

(b) Equipment shall be CSA certified. Where there is no alternative to supplying equipment which is certified, obtain special permission from Electrical Inspection Department.

E20.6.2 Care, Operation and Start up

(a) Instruct operating and maintenance personnel in the operation, care and maintenance of systems, system equipment and components.

(b) Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

E20.7 Fabrication

E20.7.1 General

(a) Factory assemble control panels and component assemblies.

E20.7.2 Codes and Standards

(a) Complete installation in accordance with the latest edition and all subsequent revisions of CAN/CSA C22.1, Manitoba addendums and revisions, and all City of Winnipeg Electrical Bylaws.

E20.7.3 Manufacturers and CSA Labels

(a) Visible and legible, after equipment is installed.

E20.7.4 Finishes

(a) Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel. Stainless steel may also be used.

(b) Clean and touch up surfaces of shop painted equipment scratched or marred during shipment or installation, to match original paint.

(c) Clean, prime and finish coat all exposed non-galvanized hangers, racks and fastenings to prevent rusting.

E20.7.5 Wiring Identification

(a) Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

E20.8 Construction Methods

E20.8.1 Codes and Standards

(a) Complete installation in accordance with the latest edition and all subsequent revisions of CAN/CSA C22.1. , Manitoba addendums and revisions, and all City of Winnipeg Electrical Bylaws.

E20.8.2 Permits, Fees And Inspection

(a) Submit to Electrical Inspection Department and Supply Authority necessary number of Drawings and Specifications for examination and approval prior to commencement of work.

(b) Obtain site permits and pay associated fees.

(c) The Contractor shall provide Drawings and Specifications required by Electrical Inspection Department and Supply Authority at no cost.

(d) Notify Consultant of changes required by Electrical Inspection Department prior to making changes.

(e) Furnish Certificates of Acceptance from Electrical Inspection Department on completion of Work to Contract Administrator.

E20.8.3 Underbridge Lighting

(a) The existing underbridge light fixtures located at each pier shall be replaced as shown on the Drawings.

(b) Supply and install new underbridge lights at piers as shown on the Drawings. It is the Contractor’s responsibility to ensure that the underbridge lights are functional following their reconnection to the power source.

E20.9 Quality Control

E20.9.1 Inspection

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

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

E20.9.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E20.9.3 Materials

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall 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.

E20.9.4 Field Quality Control

(a) All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician; to perform specific tasks the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

(b) Furnish Manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to Manufacturer's instructions.

E20.9.5 Inspection and Acceptance

(a) After the installation of the under-bridge pedestrian light fixtures has been completed satisfactory to the Contract Administrator, the Contractor shall arrange for the final electrical inspection by Manitoba Hydro. Once the installation is approved by Hydro, Hydro will make the connection to the service. Thereafter, a final inspection will be made by the Contract Administrator with the Contractor present to ensure that the under-bridge pedestrian lights are functioning satisfactorily.

E20.10 Measurement and Payment

E20.10.1 Underbridge Light Fixtures

(a) The supply and installation of electrical items and their appurtenances for the underbridge shall not be measured. This electrical Work shall be paid for at the Contract Lump Sum Price for, “Underbridge Light Fixtures”, performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

E21. ELECTRICAL CONDUITS

E21.1 Description

(a) This Specification shall cover the supply, installation, and tie-in of Manitoba Hydro, MTS conduits, and City conduits within the concrete expansion joint block-outs, abutments, and approach sidewalk slabs, and traffic barriers.

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

E21.2 Referenced Specifications and Drawings

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

(i) CAN/CSA B196.3 – PVC Underground Telecommunication Cable Ducting and Fittings;

(ii) CAN/CSA C22.1 – Canadian Electrical Code Part 1, Manitoba addendums and revisions, and all City of Winnipeg Electrical Bylaws.

(iii) CAN/CSA C22.2 – Information Technology Equipment - Safety - Part 1: General Requirements; and

(iv) CAN/CSA C22.3 – Electrical Conduit.

E21.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) The Work under this Specification supplying and installing all conduits for the respective utility installation, support, and terminations and coordinating with utilities for the schedule of supply, specific requirements, and installation schedule.

E21.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

E21.5 Materials

E21.5.1 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.

(c) The Contractor shall supply all components necessary for a proper installation except for those items identified above as supplied by the Utilities.

(d) Miscellaneous materials shall be of a type as indicated on the Drawings and required for a complete and proper installation and as accepted by the Contract Administrator.

E21.5.2 Manitoba Hydro Conduits

(a) The Contractor shall supply 127 mm ID diameter conduits to be installed within expansion joint blockouts and within the approach sidewalk slabs, identified on the Drawings as Manitoba Hydro ducts. The conduit will be 127 mm ID PVC duct certified to the requirements of CAN/CSA Standard c22.1 No 211.1. The supply of the pipe will include the associated bends and couplings. The pipe will be supplied in standard 3 or 6 m lengths. The Contractor shall also supply the neoprene expansion joint sleeves as specified on the Drawings.

(b) The Contractor shall supply 50 mm ID diameter street light conduits. These shall be installed within the expansion joint blockouts and within the sidewalk slabs, identified on the Drawings as street light conduit. In addition, conduit shall also be installed within the south barrier as identified on the Drawings as street light conduit. The

conduit will be 50 mm ID PVC duct certified to the requirements of CAN/CSA Standard c22.1 No 211.1. The supply of the pipe will include the associated bends and couplings. The pipe will be supplied in standard 3 or 6 m lengths. The Contractor shall also supply expansion joint sleeves, as approved by the Contract Administrator.

E21.5.3 MTS Conduits

(a) The Contractor shall supply 102 mm ID diameter conduits to be installed within expansion joint blockouts and within the approach sidewalk slab, identified on the Drawings as MTS ducts. The conduit will be 102 mm ID PVC duct certified to the requirements of CAN/CSA C22.2 No. 211.1. This supply of pipe will include the associated bends, couplings and conduit concrete solvent. The pipe will be supplied in standard 3 or 6 m lengths. The Contractor shall also supply the neoprene expansion joint sleeves as specified on the Drawings.

E21.5.4 City Conduits

(a) The Contractor shall supply 127 mm ID diameter conduit to be installed within expansion joint blockouts and within the approach sidewalk slab, identified on the Drawings as City ducts. The conduit will be 127 mm ID PVC duct certified to the requirements of CAN/CSA C22.2 No. 211.1. This supply of pipe will include the associated bends, couplings and conduit concrete solvent. The pipe will be supplied in standard 3 or 6 m lengths. The Contractor shall also supply the neoprene expansion joint sleeves as specified on the Drawings.

E21.6 Equipment

E21.6.1 General

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

E21.7 Construction Methods

E21.7.1 Placing of Conduit

(a) The conduits shall be firmly anchored in place to prevent movement and floating during placing of the concrete. Extreme care shall be exercised when placing concrete to prevent damage to any conduits.

(b) All conduit connections shall be made in accordance with the Manufacturer's instructions.

(c) The conduit shall be installed with gradual changes in direction so that fish wire and/or wiring can easily be threaded through.

(d) Supply and install expansion/contraction joints across the expansion/contraction joints of the bridge supplied by the same Manufacturer as the PVC duct and acceptable to the Contract Administrator.

E21.7.2 Obstructions

(a) Upon completion of installation of conduits, the Contractor shall ascertain that no obstructions are blocking any empty conduit by pulling through a mandrel. If any obstruction is encountered, it shall be removed by the Contractor at his own expense.

E21.7.3 Conduits for Phase 2 Removals and Construction

(a) Conduits for Phase 2 Removals and Construction shall be installed in accordance with the phasing shown on Drawing B178-14-04.

(b) Prior to commencing Phase 2B Removals, new conduit shall be installed within the expansion joint blockouts and the approach sidewalk slabs as shown on the Drawings. Refer also to E8, "Structural Removals" for further descriptions of staging of removal and construction operations for conduits and live cables.

(c) Prior to placing concrete and following completion of Phase 2B Removals, new conduit shall be installed within the expansion joint blockouts and the approach

sidewalk slabs as shown on the Drawings. Refer also to E8, “Structural Removals” for further descriptions of staging of removal and construction operations for conduits and live cables.

(d) Coordination will be required with Manitoba Hydro for this Work. Contact appropriate utilities when working in the vicinity of their conduit/cables in the event that they want to assign an inspector to the Contractor’s Work. The Drawings show approximate locations of utilities. Refer to Drawings and contact utilities for further information regarding specific utility locations.

(e) Construction of the abutment backwall, expansion joint blockouts, and approach sidewalk slabs require protection and coordination surrounding the live cables. Temporary power shutdown will be required for construction around these areas. Coordinate with Manitoba Hydro to make arrangements for safety watches and temporary power shutdown as required. Power shutdowns should be coordinated and minimized as much as possible.

E21.8 Quality Control

E21.8.1 Inspection

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

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

E21.8.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E21.8.3 Materials

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall 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.

E21.9 Measurement and Payment

E21.9.1 Electrical Conduits

(a) The supply and installation of electrical conduits and their appurtenances shall be paid for at the Contract Unit Price per lineal metre for the ”Items of Work” listed below, performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(i) Electrical Conduits:

(i) 127 mm – Supply & Install;

(ii) 102 mm – Supply & Install; and

(iii) 50 mm – Supply & Install.

E22. EXPOSING EXISTING UNDERGROUND UTILITIES

E22.1 Description

(a) This Specification shall cover the exposing of existing larger diameter and high pressure gas lines and MTS ductlines prior to roadway and sidewalk excavation for the purpose of determining their actual elevation.

(b) Construction of the Portage Avenue Twin Bridges over Sturgeon Creek shall take place in two separate phases; Phase 1 Work will take place in spring/summer 2014 and Phase 2 Work will take place in summer/fall 2014. Phasing of all Work shall take place as shown on the Drawings.

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

E22.2 Referenced Specifications and Drawings

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

(i) CW 2030 - Excavation Bedding and Backfill

E22.3 Material

E22.3.1 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.

E22.3.2 Backfill Material

(a) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand in accordance with CW 2030.

E22.4 Equipment

E22.4.1 General

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

E22.5 Construction Methods

E22.5.1 Hydro-Excavation

(a) Prior to any excavation taking place on site in the vicinity of the larger diameter and high pressure gas lines, MTS ductlines, Manitoba Hydro ductlines, and City of Winnipeg Traffic Services ductlines, the Contractor shall expose the gas line or ductline in question by hydro-excavating. It is anticipated that there will be thirteen locations where hydro-excavation will be required.

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

E22.5.2 Manitoba Hydro Safety Watch

(a) The Contractor is advised that a safety watch will be required for the entire duration of the hydro-excavation to expose the gas lines and at all times during roadway excavation in the vicinity of the gas lines.

(b) At no time shall excavation of any kind be permitted in the vicinity of the gas lines if Manitoba Hydro safety watch personnel are not present.

(c) Due to heavy workloads during construction season, Manitoba Hydro has advised that a minimum of one week's notice is required prior to excavation to schedule safety watch personnel.

(d) Costs for Hydro safety watch during hydro-excavation of gas lines and during pavement excavation in the vicinity of gas lines shall be included with the Work of this specification and will be included with the cost of roadway pavement excavation and no further measurement or payment will be made.

E22.6 Quality Control

E22.6.1 Inspection

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

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

E22.6.2 Access

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

E22.7 Measurement and Payment

E22.7.1 Exposing Existing Underground Utilities

(a) Hydro-excavation for exposing of larger diameter and high pressure gas lines, MTS ductlines, Manitoba Hydro ductlines, and City of Winnipeg Traffic Services ductlines shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Exposing Existing Underground Utilities", 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.

E23. TRITON WATER FILLED TRAFFIC BARRIERS

E23.1 Description

(a) This Specification covers the transportation, placement and assembly, relocation, removal, and return of Triton water filled traffic barriers to the limit shown on the Construction Staging Drawings.

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

E23.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Transporting (including loading) empty Triton water filled traffic barriers from City of Winnipeg Bridge Yard to Site and installing on Site as shown on the Drawings;

(ii) Relocating Triton water filled traffic barriers between construction phases as required;

(iii) Removing Triton water filled traffic barriers from Site and transporting (including unloading) them to the City of Winnipeg Bridge yard; and

(iv) Maintaining Triton water filled traffic barriers in position on site throughout the Project as part of his/her overall Work and traffic management plans.

E23.3 Materials

E23.3.1 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.

E23.3.2 Triton Water Filled Traffic Barriers

(a) The Triton water filled traffic barriers will be supplied by the City of Winnipeg Public Works Department.

(b) It may be necessary to add glycol to the water filled traffic barriers in near freezing conditions, depending on the time of year that the Triton barriers are required.

E23.4 Construction Methods

E23.4.1 Transportation of Triton Traffic Barriers

(b) The empty Triton traffic barriers are currently located at the City of Winnipeg Bridge Yard.

(c) The barriers are located at the
City of Winnipeg Public Works Bridge Yard
849 Ravelston Ave. W.
Phone: (204) 794-8510
Contact: Mr. Mike Terleski, C.E.T.

(d) The Contractor shall, prior to picking up the empty Triton traffic barriers, identify and record with City personnel or the Contract Administrator any barriers and applicable components that are damaged and not acceptable for use or are damaged but still able to perform their intended use.

(e) The Contractor shall use every reasonable effort to protect the Triton barriers from damage due to routine handling by his forces or those of his subcontractors during the Project. The Contractor may be responsible for the cost of replacing any barriers determined by the Contract Administrator to have been damaged as a result of careless handling by the Contractor or his subcontractors.

(f) A minimum of twenty-four (24) hours notice is required prior to pick up of the Triton traffic barriers. Once the barriers have reached the Site, they shall be carefully unloaded, placed, and assembled at the locations shown on the Drawings.

E23.4.2 Installation of Triton Water Filled Traffic Barriers

(a) The Contractor shall arrange for safe loading and transportation of the required Triton traffic barriers from the City Bridge Yard to the specific Site locations requiring Triton traffic barriers and install the barriers and fill with water as indicated on the Drawings or as directed by the Contract Administrator to effect temporary road and other access closures.

(b) Triton water filled traffic barriers shall be installed in proper vertical and horizontal alignments and properly connected to the satisfaction of the Contract Administrator.

(c) Schedules for installing or removing the Triton water filled traffic barriers on/from roadway and other access closures are to be approved by the Contract Administrator prior to any Work beginning on those items.

(d) The Contractor shall also install the bracket to connect together the temporary precast concrete barriers and the Triton water filled traffic barriers.

E23.4.3 Relocation of Triton Water Filled Traffic Barriers

(a) The Contractor shall relocate Triton water filled traffic barriers between construction phasing as shown on the Drawings.

E23.4.4 Removal of Triton Water Filled Traffic Barriers

(a) The Contractor shall drain and remove the empty Triton traffic barriers from various locations on the Site and transport them back to the City Bridge Yard, as approved by the Contract Administrator, when their use is no longer required on site.

(b) The Contractor shall return all barriers to the City Bridge Yard, as identified in E29.3.1(b). 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 for 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 personnel shall inspect and inventory the barriers and all applicable components.

E23.5 Quality Control

E23.5.1 Inspection

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

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

E23.5.2 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.

E23.6 Measurement and Payment

E23.6.1 Transportation and Installation of Temporary Triton Water Filled Traffic Barriers

(a) Transporting and installing Triton water filled traffic barriers shall be paid for at the Contract Unit Price per unit for "Transport and Install Triton Water Filled Traffic Barriers" 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.

E23.6.2 Relocation of Temporary Triton Water Filled Traffic Barriers

(a) Relocating and Triton water filled traffic barriers shall be paid for at the Contract Unit Price per unit relocated for "Relocate Triton Water Filled Traffic Barriers" 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.

E23.6.3 Removal and Transportation of Temporary Triton Water Filled Traffic Barriers

(a) Removing and transporting Triton water filled traffic barriers shall be paid for at the Contract Unit Price per unit for "Remove and Transport Triton Water Filled Traffic Barriers" 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.

E24. PRECAST CONCRETE BARRIERS

E24.1 Description

(a) This Specification covers the transportation, placement, assembly, relocation, removal, and return of precast concrete barriers to the limits shown on the Construction Staging Drawings.

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

E24.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Transporting (including loading) temporary precast concrete traffic barriers from City of Winnipeg yard at 849 Ravelstone Ave. to project site and installation on site;

(ii) Relocating temporary precast concrete barriers on Site between construction phasing as shown on the Drawings.

(iii) Removing from site and transporting (including unloading) temporary precast concrete traffic barriers to City of Winnipeg yard at 849 Ravelstone Ave.; and

(iv) 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).

E24.3 Materials

E24.3.1 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.

E24.3.2 Precast Concrete Barriers

(a) The precast concrete barriers will be supplied by the City of Winnipeg Public Works Department and consist of a precast section approximately 850 mm high by 2740 mm long, two steel posts and a barricade style blade that mounts between the posts on top of the precast concrete section.

E24.4 Equipment

E24.4.1 General

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

E24.5 Construction Methods

E24.5.1 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 barriers are located at the
City of Winnipeg Public Works Bridge Yard
849 Ravelston Ave. W.
Phone: (204) 794-8510
Contact: Mr. Mike Terleski, C.E.T.

(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.

E24.5.2 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 assemble the metal pole and barricade sections of the barriers onto the concrete sections. Should there be any missing nuts bolts or washers, the Contractor shall supply new galvanized nuts, bolts and/or washers.

(d) 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.

(e) The Contractor shall also install the bracket to connect together the temporary precast concrete barriers and the Triton water filled traffic barriers.

E24.5.3 Relocation of Precast Concrete Barriers

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

E24.5.4 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, as identified in E28.5.1(c). 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 replace 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.

E24.6 Quality Control

E24.6.1 Inspection

(a) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection by the Contract Administrator including

all operations from the selection and production of materials through to final acceptance of the specified Work.

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

E24.6.2 Access

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

E24.7 Measurement and Payment

E24.7.1 Transportation and Installation of Temporary Precast Concrete Barriers

(a) Transporting and installing precast concrete barriers shall be paid for at the Contract Unit Price per unit for "Transportation and Installation of Temporary Precast Concrete Barriers", 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.

E24.7.2 Relocation of Temporary Precast Concrete Barriers

(a) Relocating the precast concrete barriers shall be paid at the Contract Unit Price per unit for "Relocate Precast Concrete Barriers", 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.

(b) The total number of units to be paid shall be tracked for every barrier relocated during the appropriate construction phase, as shown on the Drawings.

E24.7.3 Removal and Transportation of Precast Concrete Barriers

(a) Removing and transporting precast concrete barriers shall be paid for at the Contract Unit Price per unit for "Removal and Transportation of Precast Concrete Barriers", 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.

E25. PROTECTION OF EXISTING TREES

E25.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

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

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

(c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

(d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the Work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within

the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

(e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E25.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his designate.

E25.3 No separate measurement or payment will be made for the protection of trees.

E25.4 Except as required in clause E6.1 (c) and E6.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E26. REMOVAL OF TREES

E26.1 The Contractor's activities within the project area shall not damage any park or private property and any existing trees. In an event that removal of trees is necessary, permission from the Contract Administrator, City's Urban Forestry Branch and the Ward Councilor is required prior to the Contractor proceeding with any removals. Any proposed tree removals shall be in accordance with City's "Tree Removal Guidelines".

(a) Before commencement of any work the Contractor shall consult with the Contract Administrator as to which trees are designated to be removed. The Contractor shall cut down only trees and shrubs designated for removal.

E26.2 Measurement and Payment

E26.2.1 Removal of Trees

(a) Removal of existing trees of varying sizes and heights shall be paid at the Contract Unit Price per unit for "Removal of Trees", 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.

E27. RELOCATION OF EXISTING PLANTERS

E27.1 Relocation of existing planters shall involve the relocation of existing flower planters from their existing location to the Park Services satellite storage compound, and back to their original location during the site restoration works, to the satisfaction of the Contract Administrator and the Park Services.

E27.2 The Contractor shall contact the Park Services representative in advance of the relocation of planters so that a small compound can be made available for the storage of flower planters. The contact at Park Services is as follows:

(a) Mr. Mark Storimans
(204) 470-4881

E27.3 A minimum of twenty-four (24) hours' notice is required prior to relocation of the planters. Once the planters have reached the storage compound they shall be carefully unloaded.

E27.4 The Contractor shall carefully remove the flower planters, at the locations shown on the Drawings and as identified by the Contract Administrator. Planters shall be stored at the Northwest corner of Sturgeon Road and Silver Avenue beside one of the Park Services satellite site.

E27.5 The Contractor may remove and dispose of any square (1220 mm x 1220 mm) flower planters that are too difficult to relocate without causing damage, but would be required to be replaced at the Contractor's expense. Replacement planters shall consist of cylindrical exposed aggregate

flower planters (small, medium and large approx.- 305 mm, 508 mm and 763 mm tall, supplied by Barkman Concrete) which would be comparable in size to the existing planters.

E27.6 The Contractor is responsible for any damage to the flower planters during the relocation and replacement, and shall replace any damaged planters or as otherwise described in this Specification to the satisfaction of the Contract Administrator and the Park Services.

E27.7 Measurement and Payment

E27.7.1 Relocation of Existing Planters

(b) Relocation of existing planters shall be paid at the Contract Unit Price per unit for "Relocation of Existing Planters", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E28. WATER OBTAINED FROM THE CITY

E28.1 Further to clause 3.7 of the latest version of the City of Winnipeg Standard Construction Specification 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.

E29. DETOUR WORKS

E29.1 Description

(a) Further to the latest version of the City of Winnipeg Standard Construction Specification CW 3235, CW 3240, CW 3330, CW 3410, and CW 3450, this Specification shall cover detour works required to complete the rehabilitation Works.

E29.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Removing and replacing existing concrete median and barrier curb at locations specified on the Drawings;

(ii) Removing and replacing the existing concrete safety median at locations specified on the Drawings;

(iii) Removing and replacing the existing concrete median slab at locations specified on the Drawings;

(iv) Removing and replacing the existing concrete bullnose at locations specified on the Drawings;

(v) Removing, salvaging, and replacing the existing interlocking paving stones at locations specified on the Drawings;

(vi) Removing, salvaging, and replacing existing planters in existing median;

(vii) Placing a temporary asphalt overlay at locations specified on the Drawings to accommodate and maintain traffic during construction; and

(viii) Restoration of all existing median facilities following completion of rehabilitation Works.

E29.3 Referenced Specifications and Drawings

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

(i) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs

(ii) CW 3240 – Renewal of Existing Curbs

(iii) CW 3330 – Installation of Interlocking Paving Stones

(iv) CW 3410 – Asphaltic Concrete Pavement Works

(v) CW 3450 – Planing of Pavement

E29.3.2 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.

E29.4 Equipment

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

E29.5 Construction Methods

(a) Detour Works

(i) The Contractor shall remove existing medians complete with barrier curb, safety median, median slab, bullnose, and interlocking pavers prior to the initiation of any other construction work on the Site

(ii) The Contractor shall complete temporary asphalt paving overlay at the locations specified on the Drawings to accommodate traffic during construction.

(iii) The Contractor is responsible for the daily maintenance of the detour including sweeping, maintenance of the traffic control devices, and any cleanup up necessary to maintain the detour operational, to the satisfaction of the Contract Administrator.

(iv) Upon completion of Phase 1 and Phase 2 Construction, the medians shall be renewed to their original condition, to the satisfaction of the Contract Administrator. Any planters present in the median shall be removed, salvaged, and stored in a safe location. Planters shall be returned to their original location during site restoration works, to the satisfaction of the Contract Administrator.

E29.6 Quality Control

E29.6.1 Inspection

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

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

E29.6.2 Access

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

E29.7 Measurement and Payment

E29.7.1 Concrete Barrier Curb Renewal

(a) Concrete barrier curb renewal will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3235.

E29.7.2 Concrete Safety Median Renewal

(a) Concrete safety median renewal will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3235.

E29.7.3 Concrete Bullnose Renewal

(a) Concrete bullnose renewal will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3235.

E29.7.4 Regrading Existing Interlocking Paving Stone

(a) Regrading existing interlocking paving stone will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3330.

E29.7.5 Planing of Pavement

(a) Planing of Pavement will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3450.

E29.7.6 Construction of Asphaltic Concrete Overlay

(a) Construction of asphaltic concrete overlay will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3410.

E30. DETECTABLE WARNING SURFACE TILES

E30.1 Description

(a) This Specification shall cover the supply and installation of detectable warning surface tiles in sidewalk ramps and multi-use path ramps.

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

E30.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications
  (i) CW 3235 - Renewal of Existing Miscellaneous Concrete Slabs;
  (ii) CW 3240 - Renewal of Existing Curbs;
  (iii) CW 3310 - Portland Cement Concrete Pavement Works; and
  (iv) CW 3325 - Portland Cement Concrete Sidewalk.

E30.3 Referenced Standard Details

(a) The latest version of the City of Winnipeg Details and Installation Manual
  (i) SD-229C – Curb Ramp Layout for Concrete Pavement;
  (ii) SD-229D – Curb Ramp Layout for Asphalt Overlay;
  (iii) SDE-229A – Curb Ramp Layout for Intersections (Attached);
  (iv) SDE-229AA – Detectable Warning Surface in Curb Ramps for Intersections (Attached);
  (v) SDE-229AB – Curb Ramp Layout for Offset Intersections (Attached);
  (vi) SDE-229BB – Detectable Warning Surface in Curb Ramps for Medians (Attached);
  (vii) SDE-229E - Curb Ramp Depressed Curb (Attached); and
  (viii) Installation Instructions for Cast in Place Inline Dome Detectable/Tactile Warning Surface Tile (Attached).

E30.4 Materials

E30.4.1 General

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

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

E30.5 Approved Products

(a) Acceptable products for:

(i) 610 x 1220 mm (2'x 4') Armor-Tile Cast in Place (Yellow)

Available from:
Engineered Plastics Inc.
1400 Cornwall Road Unit 6
Oakville, Ontario L6J 7W5
Phone: 800-682-2525
Fax: 800-769-4463
Contact: Manny Burgio

Or

Alsip's Building Products
1 Cole Avenue
Winnipeg, Manitoba
Phone. 204-667-3330
Contact: Jason Alsip

(b) Detectable warning surface tiles shall be Highway Yellow (USA); or Safety Yellow (Canada).

(c) Detectable warning surface tiles shall be cast in place type.

(d) Truncated domes on detectable warning surface tiles shall be in accordance with ADA Accessibility Guidelines (ADAAG).

E30.6 Construction Methods

E30.6.1 General

(a) Construct curb ramps, sidewalk ramps and multi-use path in accordance with referenced Standard Construction Specifications, Standard Details, and SDE Drawings (attached).

(b) Construct the lip of the depressed curb in accordance with SDE-229E.

(c) Construct sidewalk ramp grades in accordance with SD-229C and SD-229D.

(d) Install the detectable warning surface tile in accordance with the amended Manufacturer's Installation Manual (attached). Drill additional 6mm air vent holes in ribs under the tile as required and use vibration to help seat the tile, to facilitate the installation process.

(e) Trim the corner of the tile at radii in accordance with SDE-229A and SDE-229AA.

(f) Install and orient the detectable warning surface tiles as shown on the referenced drawings or as directed by the Contract Administrator.

E30.7 Measurement and Payment

E30.7.1 Detectable Warning Surface Tiles

(a) Supplying and installing detectable warning surface tiles shall be measured at the Contract Unit Price per unit for "610 x 1220mm Detectable Warning Surface Tiles"

measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The number of units to be paid for will be the total number of full or trimmed tiles supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E30.7.2 Concrete Sidewalk Ramp and Concrete Ramp for Multi-Use Paths

(a) The area under the detectable warning surface tile is part of the concrete sidewalk ramp and will be paid in accordance with CW 3235 or CW 3325.

(b) The concrete sidewalk ramp and the concrete ramp for multi-use paths shall be paid for as 100 mm sidewalk in accordance with CW 3235 or CW 3325.

E30.7.3 Curb Ramp

Curb ramp shall be paid for in accordance with CW 3240 or CW 3310.

E30.8 Drawings and Installation Manual

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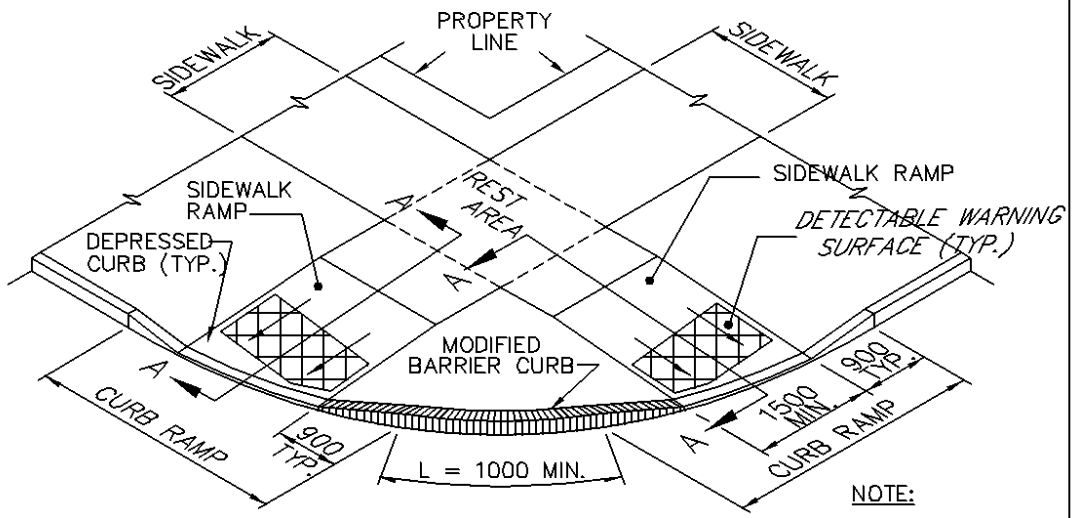
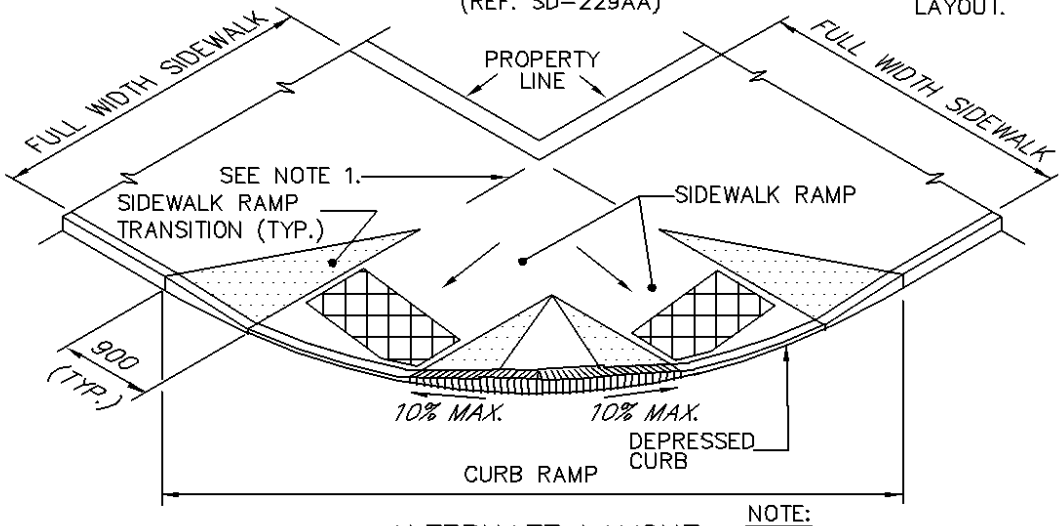


STANDARD LAYOUT
(REF. SD-229AA)

NOTE:

IF L<1000 USE ALTERNATE LAYOUT.



ALTERNATE LAYOUT
(REF. SD-229AA)

NOTE:

1. DEPRESSED CURB RAMP TO LINE UP WITH BACK OF SIDEWALK.
2. FOR SECTION A-A SEE SD-229C & SD-229D
3. SEE SDE-229AA, SDE-229BB & SDE-229E FOR DETECTABLE WARNING SURFACES.

DIMENSIONS ARE IN MILLIMETRES

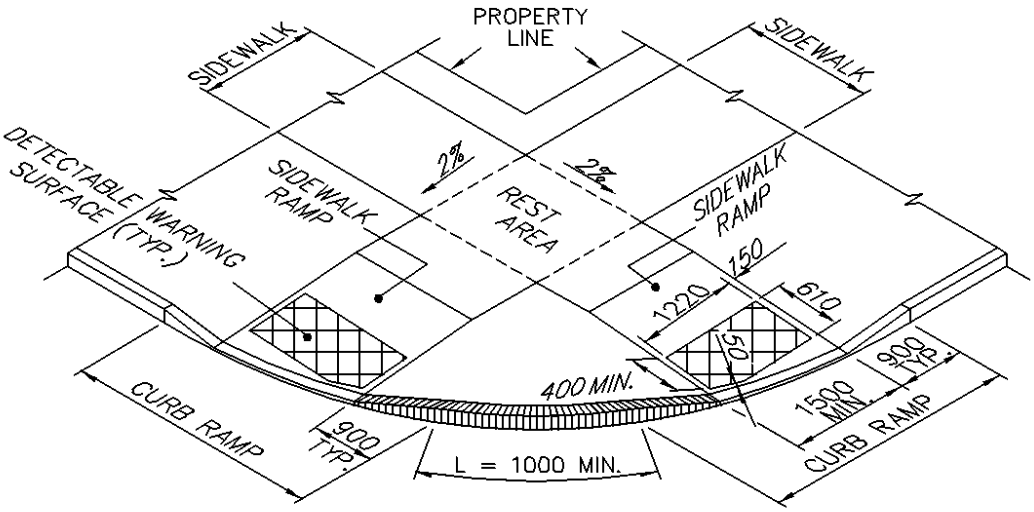
THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

Reference Spec. No.
CW 3235, CW 3310, CW 3325
E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE

CURB RAMP LAYOUT FOR INTERSECTIONS

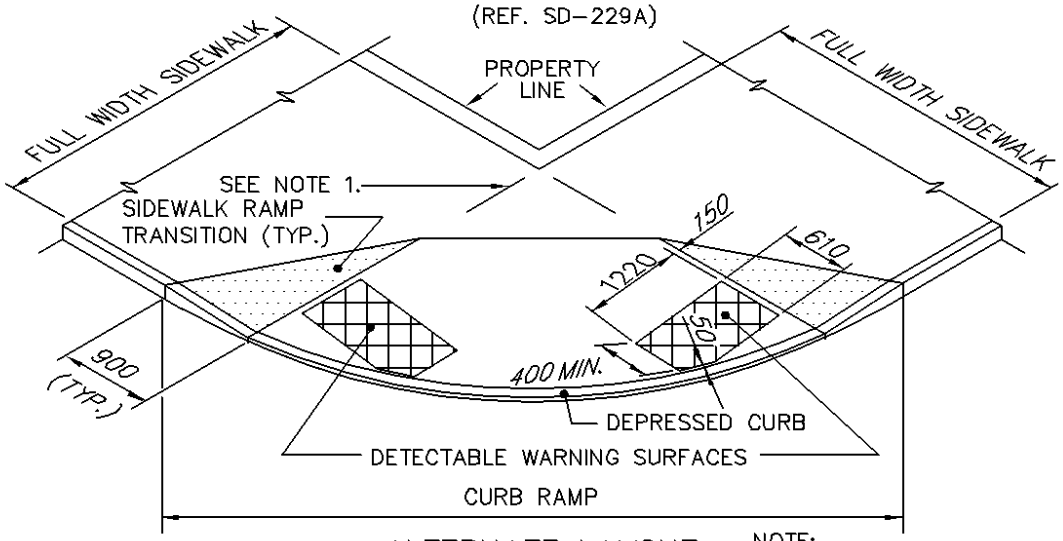
Designed By:	Drawn By:	Scale :
B.P.	T.G.A..	N.T.S.
Checked By:	Date:	Drawing No.
F.W.C.	10-02-18	SDE-229A
Approved:		

Template Version: C020131129- Main C



STANDARD LAYOUT

(REF. SD-229A)



ALTERNATE LAYOUT

(REF. SD-229A)

NOTE:

1. DEPRESSED CURB RAMP TO LINE UP WITH BACK OF SIDEWALK.
2. FOR A 1.83m WIDE SIDEWALK USE A DETECTABLE WARNING SURFACE MEASURING 610 X 1520

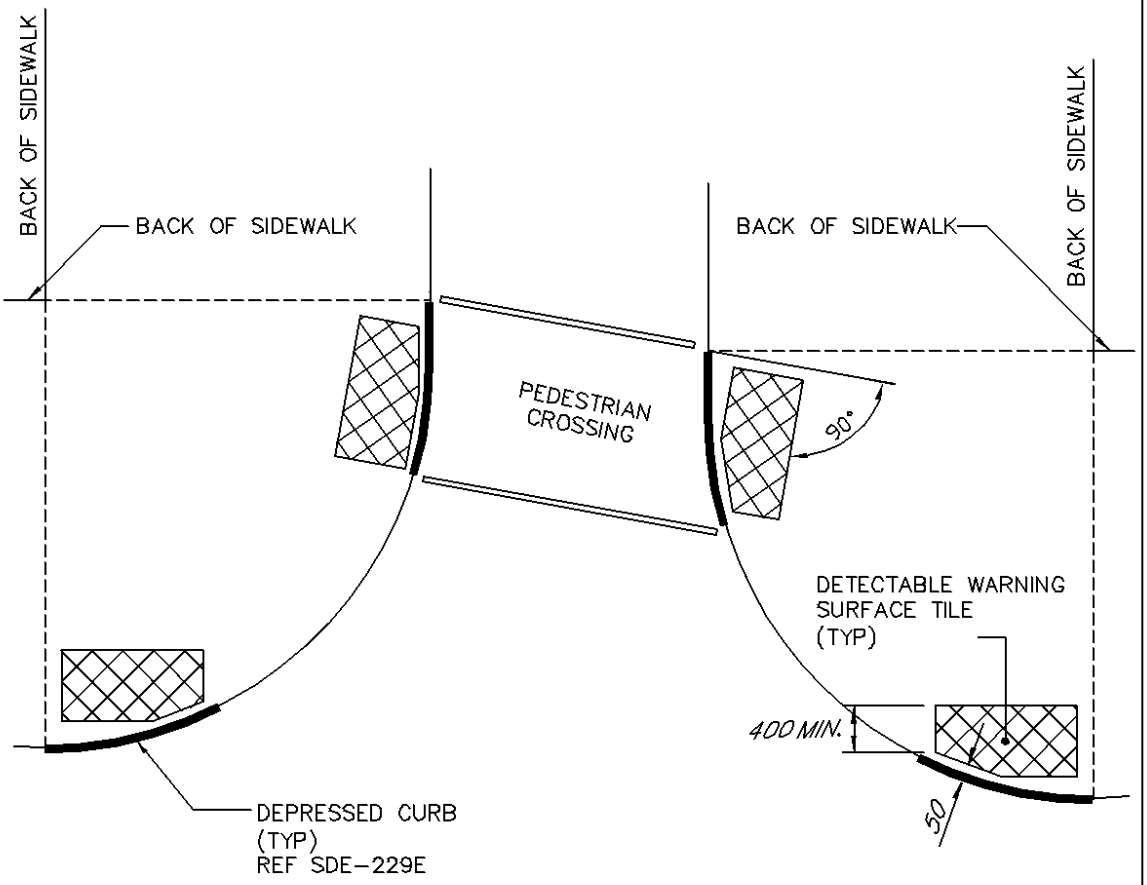
DIMENSIONS ARE IN MILLIMETRES

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

Reference Spec. No.
CW 3235, CW 3310, CW 3325
E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE

DETECTABLE WARNING SURFACE IN CURB RAMPS FOR INTERSECTIONS

Designed By: B.P.	Drawn By: T.G.A.	Scale : N.T.S.
Checked By: F.W.C.	Date: 10-02-18	Drawing No. SDE-229AA
Approved:		



NOTES:

1. LOCATE GRATINGS, ACCESS COVERS AND OTHER APPURTENANCES OUTSIDE OF CURB RAMPS, DEPRESSED CURBS, CLEAR SPACE LANDINGS AND GUTTERS AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
2. LOCATE END OF DEPRESSED CURB IN LINE WITH PROJECTED BACK OF SIDEWALK.

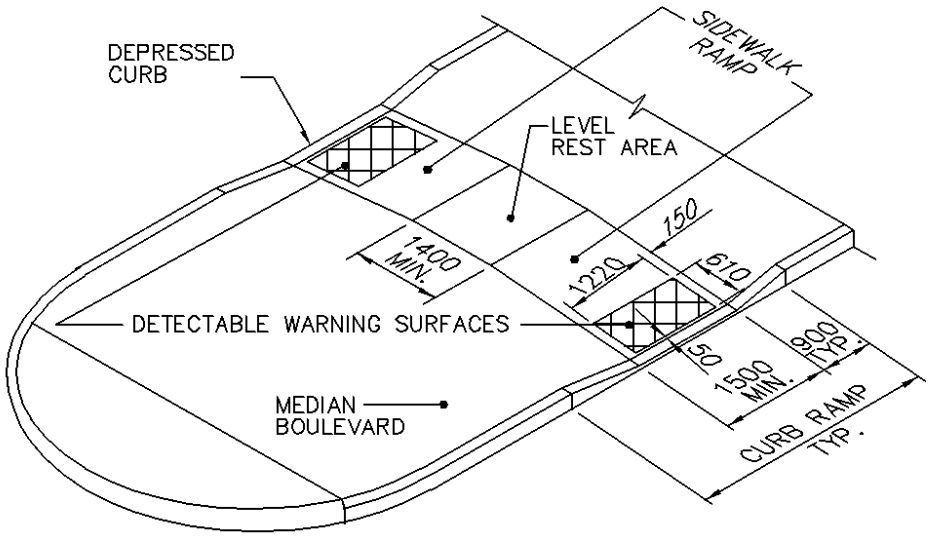
THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

Reference Spec. No.
CW 3235, CW 3310, CW 3325
E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE

DIMENSIONS ARE IN MILLIMETRES

CURB RAMP LAYOUT FOR OFFSET INTERSECTIONS

Designed By:	Drawn By:	Scale :
B.P.	T.G.A.	N.T.S.
Checked By:	Date:	Drawing No.
F.W.C.	10-02-18	SDE-229AB
Approved:		



MEDIAN SIDEWALK CROSSING

(REF. SD-229B)

NOTE:

1. FOR NARROW MEDIANS AND REFUGE ISLANDS < 1.32m IN WIDTH, PLACE DETECTABLE WARNING SURFACE FULL WIDTH, MAINTAINING 50mm SPACING FROM BACK OF CURB.

2. DETECTABLE WARNING SURFACE SHALL NOT BE PLACED AT PRIVATE APPROACHES OR ALLEYS.

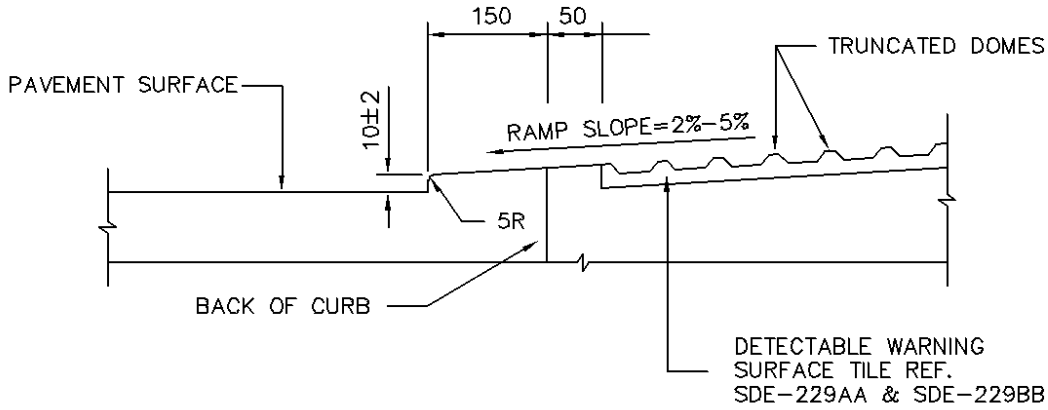
THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

Reference Spec. No.
CW 3235, CW 3310, CW 3325
E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE

DIMENSIONS ARE IN MILLIMETRES

DETECTABLE WARNING SURFACE IN CURB RAMPS FOR MEDIANS

Designed By:	Drawn By:	Scale :
B.P.	T.G.A.	N.T.S.
Checked By: F.W.C.	Date: 10-12-18	Drawing No.
Approved:		SDE-229BB



DEPRESSED CURB

NOTES:

1) SIDEWALK RAMP SURFACE SHALL BE GIVEN A PARALLEL TEXTURED BROOM FINISH.

2) INSTALL DETECTABLE WARNING SURFACE SO THAT THE TOP OF THE TRUNCATED DOMES ARE FLUSH WITH THE SURFACE FO THE ADJACENT SIDEWALK.

THE CITY OF WINNIPEG PUBLIC WORKS DEPARTMENT			
Reference Spec. No. CW 3235, CW 3310, CW 3325 E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE	DIMENSIONS ARE IN MILLIMETRES		
CURB RAMP DEPRESSED CURB	Designed By: B.P.	Drawn By: T.G.A.	Scale : N.T.S.
	Checked By: F.W.C.	Date: 10-02-18	Drawing No. SDE-229E
	Approved:		

Manufacturer's Installation Manual
Armor-Tile Cast In Place
Inline Dome Detectable/Tactile Warning Surface Tile

A. During Cast In Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.

C. The physical characteristics of the concrete shall be consistent with the contract specifications ~~while maintaining a slump range of 4 - 7 to permit solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system~~. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.

D. Prior to placement of the Cast In Place Detectable/Tactile Warning Surface Tile system, the contract drawings shall be reviewed.

E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.

F. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.

G. When preparing to set the tile, it is important that NO concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. ~~The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.~~

I. In cold weather climates it is recommended that the Cast In Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.

J. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates.

K. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

L. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the tile that may rock the tile causing a void between the underside of tile and concrete.

M. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each shall be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

N. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

O. If desired, individual tiles can be bolted together using ¼ inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.

P. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

~~Q. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the detectability properties of the Armor-Tile system as required in various jurisdictions.~~