THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 8-2011

OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, March 18, 2011

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 Contract Administrator or an authorized representative will be available at the site from 13:00 to 15:00 on Thursday, March 3, 2011.

B3.2 Available existing drawings are included as Reference Drawings. The accuracy of these drawings is not guaranteed and the Bidder must interpret based on site investigation.

B3.3 The Bidder shall not be entitled to rely on any information or interpretation received at the Site Investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

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. ADDENDA

B5.1 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.

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

B5.2.1 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

B5.2.2 The Bidder is responsible for ensuring that he 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.

B5.3 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.

B6. SUBSTITUTES

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

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

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

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

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

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

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

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

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

B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

B6.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.

B6.6.1 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 wishes to inform.

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

B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his 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 B15.

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

B6.10 Notwithstanding B6.2 to B6.9, and in accordance with B7.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

B7. BID COMPONENTS

B7.1 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;

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

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

B7.4 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.

B7.4.1 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.

B7.4.2 A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.

B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.

B7.6 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 B15.1(a).

B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B7.8 Bids shall be submitted to:

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

B8. BID

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

B8.2 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 own name, his 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 own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

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

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

B8.4 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 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 own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

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

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

B9. PRICES

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

B9.1.1 For the convenience of Bidders, and pursuant to B7.4.2 and B15.4.3, a hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence. An electronic spreadsheet Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Material Management Division website at http://www.winnipeg.ca/matmgt.

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

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

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

B10. QUALIFICATION

B10.1 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.

B10.2 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

B10.3 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);

B10.4 Further to B10.3(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 valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or

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

B10.5 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.

B10.6 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.

B11. BID SECURITY

B11.1 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.

B11.1.1 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.

B11.1.2 All signatures on bid securities shall be original.

B11.1.3 The Bidder shall sign the Bid Bond.

B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B11.2 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.

B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B11.3 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.

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

B12.1 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.

B12.1.1 Bidders or their representatives may attend.

B12.2 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

B12.3 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

B12.4 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.

B13. IRREVOCABLE BID

B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B13.2 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.

B14. WITHDRAWAL OF BIDS

B14.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B14.1.1 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.

B14.1.2 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.

B14.1.3 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 B14.1.3(b), declare the Bid withdrawn.

B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 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.

B15. EVALUATION OF BIDS

B15.1 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 B10 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B6.

B15.2 Further to B15.1(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.

B15.3 Further to B15.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.

B15.4 Further to B15.1(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.

B15.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.

B15.4.2 Further to B15.1(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.

B15.4.3 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

B16. AWARD OF CONTRACT

B16.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B16.2 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.

B16.2.1 Without limiting the generality of B16.2, 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.

B16.3 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 B15.

B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his 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 Work to be done under the Contract shall consist of Bridge Rehabilitation and the Associated Roadwork.

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

(a) Bridge Work: Phase 1 – Northbound Bridge (2011)

(i) Detour traffic from Northbound Structure;
(ii) Coordinate with Manitoba Hydro to disconnect and remove the existing roadway lighting on the Bridge;
(iii) Remove existing handrail;
(iv) Remove existing asphalt wearing surface on Bridge and abutments;
(v) Saw cut and remove existing concrete deck slab overhangs;
(vi) Remove existing concrete sidewalk;
(vii) Remove existing concrete median;
(viii) Remove existing concrete barriers and portion of abutment wingwalls;
(ix) Remove existing abutment backwall;
(x) Remove existing precast concrete channel girders;
(xi) Remove existing Stage I deck concrete;
(xii) Remove Stage II deck concrete;
(xiii) Remove Stage III deck concrete;
(xiv) Prepare existing concrete surface by hydrodemolition;
(xv) Remove existing expansion joints;
(xvi) Remove existing north abutment concrete approach slab and portion of concrete slab;
(xvii) Remove existing south abutment upper concrete slab;
(xviii) Remove existing deck drains and restore concrete deck;
(xix) Remove existing concrete and install new deck drains;
(xx) Remove and dispose of abandoned electrical or communication conduits not removed by others;
(xxi) Remove existing navigation lighting and install temporary navigation lighting;
(xxii) Temporarily relocate River Level Monitoring System;
(xxiii) Expose, inspect, repair, and protect existing post tensioning tendons in concrete deck;
(xxiv) Remove and replace existing bearings on piers and abutments;
(xxv) Construct new reinforced concrete deck slab;
(xxvi) Construct new reinforced concrete deck overhang, sidewalk slabs, and curb on Bridge and abutments;
(xxvii) Construct new reinforced concrete traffic barriers on Bridge and abutments;
(xxviii) Construct new reinforced concrete bases for street lights;
(xxix) Construct modified abutments;

(xxx) Supply and install new expansion joints;
(xxxi) Construct new High Performance Concrete (HPC) overlay;
(xxxii) Construct new Sidewalk Wearing Surface Concrete (WSC) overlay;
(xxxiii) Construct new reinforced concrete approach and approach roadway slabs;
(xxxiv) Construct new concrete north abutment slab;
(xxxv) Supply and install new aluminum pedestrian handrail and associated architectural details;
(xxxvi) Repair miscellaneous areas of concrete;
(xxxvii) Coordinate with Manitoba Hydro for their installation, wiring, and connection of new street lights on Bridge.
(xxxviii) Supply and install new navigation lighting;
(xxxix) Install new River Level Monitoring System;
(xl) Supply and install new under bridge lighting and fixtures; and
(xli) Apply activated arc zinc spray on precast concrete girders and concrete diaphragms at abutment ends.

(b) Bridge Work: Phase 2 – Southbound Bridge (2012)
(i) Detour traffic from Southbound Structure;
(ii) Coordinate with Manitoba Hydro to disconnect and remove the existing roadway lighting on the Bridge;
(iii) Remove existing handrail;
(iv) Remove existing asphalt wearing surface on Bridge and abutments;
(v) Saw cut and remove existing concrete deck slab overhangs;
(vi) Remove existing concrete sidewalk;
(vii) Remove existing concrete median;
(viii) Remove existing concrete barriers and portion of abutment wingwalls;
(ix) Remove existing abutment backwall;
(x) Remove existing precast concrete channel girders;
(xi) Remove existing Stage I deck concrete;
(xii) Remove Stage II deck concrete;
(xiii) Remove Stage III deck concrete;
(xiv) Prepare existing concrete surface by hydrodemolition;
(xv) Remove existing expansion joints;
(xvi) Remove existing north abutment concrete approach slab and portion of concrete slab;
(xvii) Remove existing south abutment upper concrete slab;
(xviii) Remove existing deck drains and restore concrete deck;
(xix) Remove existing concrete and install new deck drains;
(xx) Remove and dispose of abandoned electrical and communication conduits not removed by others;
(xxi) Remove existing navigation lighting and install temporary navigation lighting;
(xxii) Temporarily relocate River Level Monitoring System;
(xxiii) Expose inspect, repair, and protect existing post tensioning tendons in concrete deck;
(xxiv) Remove and replace existing bearings on piers and abutments;
(xxv) Construct new reinforced concrete deck slab;
(xxvi) Construct new widened reinforced concrete deck overhang, sidewalk slabs, and curb on Bridge and abutments;
(xxvii) Construct new reinforced concrete traffic barriers on Bridge and abutments;
(xxviii) Construct new reinforced concrete bases for street lights;

(xxix) Construct modified abutments;
(xxx) Supply and install new expansion joints;
(xxxi) Construct new High Performance Concrete (HPC) overlay;
(xxxii) Construct new Sidewalk Wearing Surface Concrete (WSC) overlay;
(xxxiii) Construct new reinforced concrete approach and approach roadway slabs;
(xxxiv) Construct new concrete north abutment slab;
(xxxv) Supply and install new aluminum pedestrian handrail and associated architectural details;
(xxxvi) Repair miscellaneous areas of concrete;
(xxxvii) Coordinate with Manitoba Hydro for their installation, wiring, and connection of new street lights on Bridge.
(xxxviii) Coordinate with MTS to ensure their conduits remain live throughout construction;
(xxxix) Supply and install new navigation lighting;
(xl) Install new River Level Monitoring Systems;
(xli) Supply and install new under bridge lighting at each end of Bridge;
(xlii) Construct modified pier cap to join together concrete deck slab,pier caps, and intermediate diaphragms;
(xliii) Construct new concrete bridge median barriers;
(xliv) Apply activated arc zinc spray on precast concrete girders and concrete diaphragms at abutment ends;
(xlv) Install slope paving protection beneath Northbound and Southbound Bridges;
(xlvi) Complete landscaping around Northbound and Southbound Bridges; and
(xlvii) Open Southbound Bridge to traffic.

(c) Roadwork: Phase 1 – Northbound Lanes (2011)
  (i) Phase 1A:
    (i) Stage traffic with City of Winnipeg Traffic Services Branch and Traffic Signals Branch;
    (ii) Remove concrete medians;
    (iii) Construct median pavement infill including asphalt overlay; and
    (iv) Install temporary concrete median barrier and crash barrels.
  (ii) Phase 1B:
    (i) Stage traffic with City of Winnipeg Traffic Services Branch and Traffic Signals Branch;
    (ii) Adjust temporary concrete median barrier and crash barrels;
    (iii) Plane existing asphalt pavement;
    (iv) Remove existing sidewalk and curb;
    (v) Adjust or replace existing drainage inlets;
    (vi) Construct full depth concrete repairs and pavement structure widenings;
    (vii) Install concrete sidewalk with indicator strips and curb;
    (viii) Place asphalt overlay, including tie-ins and patches; and
    (ix) Place topsoil and seeding.
  (iii) Phase 1C:
    (i) Stage traffic with City of Winnipeg Traffic Services Branch and Traffic Signals Branch; and
    (ii) Adjust temporary concrete median barrier and crash barrels.

(d) Roadwork: Phase 2 – Southbound Lanes (2012)

(i) Phase 2A:

(i) Stage traffic with City of Winnipeg Traffic Services Branch and Traffic Signals Branch;

(ii) Adjust temporary concrete median barrier and crash barrels;

(iii) Plane existing asphalt pavement;

(iv) Remove existing sidewalk and curb;

(v) Adjust or replace existing drainage inlets;

(vi) Construct full depth concrete repairs and pavement structure widenings;

(vii) Install concrete sidewalk with indicator strips and curb;

(viii) Place asphalt overlay, including tie-ins and patches; and

(ix) Place topsoil and seeding;

(ii) Phase 2B:

(i) Stage traffic with City of Winnipeg Traffic Services Branch and Traffic Signals Branch;

(ii) Adjust temporary concrete median barrier and crash barrels;

(iii) Plane existing asphalt pavement;

(iv) Adjust or replace existing drainage inlets;

(v) Construct full depth concrete repairs;

(vi) Install concrete median; and

(vii) Place asphalt overlay, including tie-ins and patches.

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) **"HPC Overlay"** means a High Performance Concrete Overlay to be cast on top of the new Bridge deck slab concrete. Refer to E13 "High Performance Concrete (HPC) Overlay" for further details.

(e) **"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.

(f) **"Indicator Strips"** means a ground surface that is in colour-contrast to an adjacent accessible route. For this project this means clay brick pavers/paving stones in formed blockouts within the sidewalk. These delineate the edges of the accessible sidewalk and are typically located at the back of road curb, and the sidewalk edge at the property line. For this project, the terms indicator strips, paving bands, paving stones, or clay brick pavers can be used interchangeably.

(g) **"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.

(h) **"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.

(i) **"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.

(j) **"WSC Overlay"** means a Sidewalk Wearing Surface Concrete Overlay to be cast on top of the new Bridge sidewalk slab concrete. Refer to E14, "Sidewalk Wearing Surface Concrete (WSC) Overlay" for further details.

D4. CONTRACT ADMINISTRATOR

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

Mr. Doug Stewart, P.Eng
Project Manager
400-161 Portage Ave. East, Winnipeg MB R3B 0Y4

Telephone No. (204) 954-6913
Facsimile No. (204) 988-0546

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

D5. CONTRACTOR'S SUPERVISOR

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

D6. NOTICES

D6.1 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.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D4.1.

D6.3 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
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9

Facsimile No.: (204) 949-1174

D6.4 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 address or facsimile number:

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

Facsimile No.: (204) 947-9155

D7. FURNISHING OF DOCUMENTS

D7.1 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 at cost.

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

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

D9. SAFE WORK PLAN

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

D9.2 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. INSURANCE

D10.1 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) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars ($2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;

(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.

D10.2 Deductibles shall be borne by the Contractor.

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

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

D11. PERFORMANCE SECURITY

D11.1 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.

D11.1.1 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.

D11.2 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.

D12. SUBCONTRACTOR LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at 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.

D13. EQUIPMENT LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at 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. 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;

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

(c) a daily manpower schedule for the Work;

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 major construction stages and phases of the Work as well as showing those activities/tasks on the critical path for each phase of the Work:

(a) Bridge Work: Phase 1 – Northbound Bridge (2011)

(i) Installation and removal of pedestrian and traffic control;
(ii) Relocation of utilities;
(iii) Installation of temporary and demolition catch platforms;
(iv) Structural removals;
(v) Exposal and inspection of post tensioning strands in concrete deck slab;
(vi) Repair and protection of post tensioning strands in concrete deck slab;
(vii) Surface preparation of existing concrete deck slab;
(viii) Removal and replacement of bearings;
(ix) Forming for deck, overhangs, sidewalk slab, curb, barriers, abutment modifications, pier modifications, and north abutment slab;
(x) Placement of reinforcing and concrete for deck slabs, sidewalk slabs, barriers, approach and approach roadway slabs, and abutment modifications;
(xi) Miscellaneous concrete repair work;
(xii) HPC overlay;
(xiii) Sidewalk WSC overlay;
(xiv) Installation of new aluminum pedestrian handrail, art balusters, and art gateway panels;
(xv) Installation of new expansion joints;
(xvi) Installation of under bridge lighting and fixtures;
(xvii) Installation of navigation lighting; and
(xviii) Installation of River Level Monitoring System.

(b) Roadwork: Phase 1 – Northbound Bridge (2011)

(i) Construction of temporary detours;
(ii) Planing of existing asphalt pavement;
(iii) Removal of existing sidewalk and curb;
(iv) Adjustment or replacement existing drainage inlets;
(v) Construction of full depth concrete repairs and pavement structure widenings;
(vi) Installation of concrete sidewalk with indicator strips and curb;
(vii) Placement of asphalt overlay, including tie-ins and patches; and
(viii) Placement of topsoil and seeding.

(c) Bridge Work: Phase 2 – Southbound Bridge (2012)

(i) Installation and removal of pedestrian and traffic control;
(ii) Relocation of utilities;
(iii) Installation of temporary and demolition catch platforms;
(iv) Structural removals;
(v) Exposal and inspection of post tensioning strands in concrete deck slab;
(vi) Repair and protection of post tensioning strands in concrete deck slab;

(vii) Surface preparation of existing concrete deck slab;
(viii) Removal and replacement of bearings;
(ix) Forming for deck, overhangs, sidewalk slab, curb, barriers, abutment modifications, pier modifications, and north abutment slab;
(x) Placement of reinforcing and concrete for deck slabs, sidewalk slabs, barriers, approach and approach roadway slabs, abutment modifications, and pier modifications;
(xi) Modifications to southwest retaining wall;
(xii) Miscellaneous concrete repair work;
(xiii) HPC overlay;
(xiv) Sidewalk WSC overlay;
(xv) Installation of new aluminum pedestrian handrail, art balusters, and art gateway panels;
(xvi) Installation of new expansion joints;
(xvii) Installation of under bridge lighting and fixtures;
(xviii) Installation of navigation lighting; and
(xix) Slope paving protection work.

(d) Roadwork: Phase 2 – Southbound Bridge (2012)
(i) Construction of temporary detours;
(ii) Planing of existing asphalt pavement;
(iii) Removal of existing sidewalk and curb;
(iv) Adjustment or replacement existing drainage inlets;
(v) Construction of full depth concrete repairs and pavement structure widenings;
(vi) Installation of concrete sidewalk with indicator strips and curb;
(vii) Placement of asphalt overlay, including tie-ins and patches; and
(viii) Placement of topsoil and seeding.

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(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

D14.6 Further to D14.2(b), the Gantt chart shall be updated bi-weekly, to be viewed and discussed at the construction meetings.

D14.7 The Contractor shall submit to the Contract Administrator, at the beginning of each week, a weekly schedule including expected activities to take place on site and the manpower on site, in accordance with D14.5.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 The Contractor shall not commence any Work until he 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 D8;
(ii) evidence of the workers compensation coverage specified in C6.15;
(iii) the Safe Work Plan specified in D9;

(iv) evidence of the insurance specified in D10;

(v) the performance security specified in D11;

(vi) the Subcontractor list specified in D12;

(vii) the equipment list specified in D13;

(viii) the detailed work schedule specified in D14

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

D15.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D15.4 The City intends to award this Contract by April 1, 2011

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

D16. 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 shall be completed in 2011,

(a) Bridge Work shall be subdivided into two (2) sub-phases: Phase 1 and 1A Demolition and Phase 1 and Phase 1A Construction. Refer to Drawings B109-11-015 to B109-11-016 for phase details and major construction activities.

(b) Roadwork shall be subdivided into three (3) sub-phases: Phase 1A, 1B, and 1C. Refer to Drawings B109-11-132 to B109-11-134 for phase details and major construction activities.

D16.1.2 Phase 2 shall be completed in 2012,

(a) Bridge Work shall be subdivided into two (2) sub-phases: Phase 2 and 2A Demolition, Phase 2 and 2A Construction. Refer to Drawings B109-11-016 to B109-11-017 for phase details and major construction activities.

(b) Roadwork shall be subdivided into two (2) sub-phases: Phase 2A and 2B. Refer to Drawings B109-11-135 to B109-11-136 for phase details and major construction activities.

D16.2 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. CRITICAL STAGES

D17.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Completion of Phase 1 and 1A Construction for Bridge Work and Phase 1B for Roadwork by October 15, 2011.

(b) Completion of Phase 1C Roadwork by October 22, 2011 such that the entire Northbound facility can be safely opened to traffic and pedestrians and all associated detours can be removed, as determined by the Contract Administrator.

(c) The existing Southbound Bridge cannot be shut down to traffic for Phase 2 Construction until April 16, 2012.

(d) Completion of Phase 2 and 2A Construction for Bridge Work by October 15, 2012.

(e) Completion of Phase 2B Roadwork by October 22, 2012 such that the entire Southbound facility can be safely opened to traffic and pedestrians and all associated detours can be removed, as determined by the Contract Administrator.

D17.2 When the Contractor considers the Work associated with both Phases 1 and 2 to be completed the Contractor shall arrange, attend and assist in the inspection of the Work with the contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

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. CONTRACTOR LIGHTING DURING CONSTRUCTION

D19.1 The Contractor shall not apply direct lighting to any nearby residential buildings for the construction of the Work.

D20. WORK BY OTHERS

D20.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) Supply, Fabrication, and Delivery of Bearings: Osborne Street Bridge, Bid Opportunity 957-2010 – coordination with supplier of bearings to be replaced;

(b) Manitoba Hydro Lighting Division – Removal and re-installation of existing roadway light standards and high mast lights and related wiring and foundations. Relocation of existing ornamental light standards on east sidewalk between Roslyn Road and River Avenue to property line;

(c) Manitoba Hydro Gas Division – Adjustment of existing gas valves on large diameter and high pressure gas mains, safety watch during work in the vicinity of large diameter and high pressure gas mains, relocation of utility conduits;

(d) MTS Allstream Inc. – Relocation of utility conduits;

(e) Shaw Cable;

(f) City of Winnipeg Traffic Signals – Temporary pole relocation and/or reconstruction of the traffic signal infrastructure at the intersections of Osborne Street and Broadway Avenue, Osborne Street and Roslyn Road, and Osborne Street and River Avenue. Installation of traffic signal infrastructure at the intersection of Osborne Street and Mostyn Place/Assiniboine Avenue;

(g) City of Winnipeg Traffic Services – Set up, maintain and remove required signage and traffic control for rush hour traffic staging;

(h) Special Events – The following special events have been identified to occur during the summer and fall of 2011 and/or 2012. The dates shown are tentative and subject to change:

(i) Osborne Village Canada Day; July 1, 2011 and July 1, 2012;

(ii) Pride Winnipeg: June 5, 2011 and June 2012;

(iii) Manitoba Marathon: June 19, 2011 and June 17, 2012. No Work shall take place at the intersection of Broadway and Osborne until the Monday following the Manitoba Marathon dates specified above;

(iv) Ciclovia: September 11, 2011 and September 9, 2012:

(v) Lights on Broadway: September 11, 2011;

(vi) Play On! Hockey: May 14-15, 2011 and May, 2012;

(i) Splash Dash Tours – Coordination to provide access to docks in Spring/Summer 2012; and

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

D20.2 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.

D20.3 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.

D21. SUBSTANTIAL PERFORMANCE

D21.1 The Contractor shall achieve Substantial Performance by October 31, 2012.

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

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

D22. TOTAL PERFORMANCE

D22.1 The Contractor shall achieve Total Performance by December 31, 2012.

D22.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D22.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D23. LIQUIDATED DAMAGES

D23.1 If the Contractor fails to achieve the Critical Stage Dates or Substantial Performance in cordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the day fixed herein for Substantial Performance during which such failure continues:

(a) Completion of Phase 1 and 1A Construction for Bridge Work and Phase 1B for Roadwork by October 15, 2011 – One Thousand Dollars ($1,000.00);

(b) Completion of Phase 1C Roadwork by October 22, 2011 – One Thousand Dollars ($1,000.00);

(c) Completion of Phase 2 and 2A Construction for Bridge Work by October 15, 2012 – One Thousand Dollars ($1,000.00);

(d) Completion of Phase 2B Roadwork by October 22, 2012 – One Thousand Dollars ($1,000.00);

(e) Substantial Performance – Three Thousand Dollars ($3,000.00).

D23.2 The amount specified for liquidated damages in D23.1is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.

D23.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D24. SCHEDULED MAINTENANCE

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

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

(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.

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

CONTROL OF WORK

D25. CONSTRUCTION MEETINGS

D25.1 Regular weekly construction 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 and updated schedule as detailed in D14.6, will be reviewed at each of these meetings.

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

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

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

D27. NAVIGABLE WATERS PROTECTION PROGRAM

D27.1 All Work shall take place in accordance to the requirements of the Navigable Waters Permit. Refer to Appendix C for further information.

D28. ENVIRONMENTAL PROTECTION PLAN

D28.1 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.

D28.2 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) C.37;
  (ii) Fisheries Act C.F14;
  (iii) Transportation of Dangerous Goods Act and Regulations c.34; and
  (iv) Navigable Waters Protection Act.

(b) Provincial
  (i) The Dangerous Goods Handling and Transportation Act D12;
  (ii) The Endangered Species Act E111;
  (iii) The Environment Act c.E125;
  (iv) The Fire Prevention Act F80;
  (v) The Manitoba Heritage Resources Act H39-1;
  (vi) The Manitoba Noxious Weeds Act N110;
  (vii) The Manitoba Nuisance Act N120;
  (viii) The Public Health Act c.P210;
  (ix) The Workplace Safety and health Act W210;
  (x) Current applicable Associated Regulations(Note: Provincial regulations updated as of September 199) and
  (xi) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.

(c) Municipal
  (i) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000'
  (ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000; and
  (iii) Any other applicable Acts, Regulations, and By-laws.

D28.3 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.

(b) Fuel Handling and Storage

(i) The Contractor shall obtain all necessary permits from Manitoba Environment 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) Refuelling of mobile equipment and vehicles shall take place at least 100 metres from a watercourse.

(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) Waste Handling and Disposal

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

(xiii) 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.

(xiv) 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).

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

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

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

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

(xix) 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.

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

(c) 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.

(d) 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:

(ii) identify exact location and time of accident;

(iii) indicate injuries, if any; and

(iv) request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup).

(v) Attend to public safety:

(vi) stop traffic, roadblock/cordon off the immediate danger area;

(vii) eliminate ignition sources; and

(viii) initiate evacuation procedures if necessary.

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

(x) personnel on Site;

(xi) cause and effect of spill;

(xii) estimated extent of damage;

(xiii) amount and type of material involved; and

(xiv) proximity to waterways, sewers, and manholes.

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

(xvi) approach from upwind;

(xvii) stop or reduce leak if safe to do so;

(xviii) dyke spill material with dry, inert absorbent material or dry clay soil or sand;

(xix) prevent spill material from entering waterways and utilities by dyking;

(xx) prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking; and

(xxi) resume any effective action to contain, clean up, or stop the flow of the spilled product.

(xxii) 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.

(xxiii) 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.

(xxiv) 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.

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

(xxvi) 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)		

(e) Noise

(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.

(f) Dust

(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) 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.

(iii) 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.

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

(g) 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.

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

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

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

(vi) 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.

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

(i) Landscaping

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

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

(j) Construction Traffic

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

(ii) 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.

(k) 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.

D29. AUTHORIZED WORK ON PRIVATE PROPERTY

D29.1 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.

D30. LAYOUT OF WORK

D30.1 Bridge Work

D30.1.1 The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Bridge Work.

D30.1.2 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.

D30.1.3 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.

D30.1.4 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.

D30.1.5 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.

D30.2 Roadwork

D30.2.1 Further to the City of Winnipeg Specification GC 6.28(h), the Contract Administrator shall mark, to the extent determined to be necessary, the location, alignment and elevation of the Work by means of stakes or marks, and the Contractor shall make the completed Works conform to the lines and marks thus indicated.

D30.2.2 Stakes and marks required shall be provided no later than one (1) Business Day following the day on which the Contractor requests such stakes and/or marks, except where the Contractor's request is made immediately following asphalt planning operations. Then the Contract Administrator may require a maximum of two (2) Business Days to provide stakes and marks as a result of required adjustments to final design grades.

D30.2.3 The Contractor shall notify the Contract Administrator immediately of the disturbance of any such stakes or marks. The cost of correcting any errors arising out of neglect of the Contractor to so notify the Contract Administrator shall be borne entirely by the Contractor, as well as the cost of replacing any disturbed stakes or marks.

D30.2.4 Before commencing Work, the Contractor shall satisfy themselves as to the meaning and correctness of all stakes and marks and no claims shall be entertained by the City on account of any alleged inaccuracies. If any error is suspected in the Drawings,

Specifications or the directions of the Contract Administrator, Work shall be discontinued until the errors are rectified, but no claims shall be made on account of any delay occasioned thereby.

D30.2.5 The Contractor shall determine and provide all dimensions and elevations measured from the stakes or marks.

D31. COOPERATION WITH OTHERS

D31.1 The Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working on the structure, approach roadways, adjacent roadways or rights-of-way. The activities of these agencies may coincide with the Contractor's execution of the Work, and it will be the Contractor's responsibility to cooperate to the fullest extent with the other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of the Contract.

MEASUREMENT AND PAYMENT

D32. PAYMENT

D32.1 Further to C12, effective January 1, 2007, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

D33. PAYMENT SCHEDULE

D33.1 Further to C12, payment shall be in accordance with the following payment schedule:

D33.2 Custom manufactured items may be included in progress estimates prior to installation on site based on the following payment schedule:

(a) 50% of the bid supply costs, on manufacture and delivery to site;

(b) 50% of the bid supply costs on installation;

(c) 100% of the bid installation costs on installation.

WARRANTY

D34. WARRANTY

D34.1 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.

D34.2 Notwithstanding C13.2 or D34.1, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:

(a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D34.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

D34.3 At least two (2) weeks prior to the expiration of the Warranty Period, or upon correction of all outstanding defects and deficiencies, whichever is later, the Contractor shall arrange, attend, and assist in acceptance inspection of the Work. The Contract Administrator shall, on being satisfied that all outstanding defects and deficiencies in the Work have been corrected, issue a Certificate of Acceptance for the Work to be dated not earlier than two (2) years after the date of the Certificate of Total Performance, or the date that the Contractor corrects the final defects

and deficiencies, whichever is the later, thereby terminating the Warranty Period. The Certificate of Acceptance will indicate acceptance of the due performance of the Contract.

FORM H1: PERFORMANCE BOND
(See D11)

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. 8-2011

OSBORNE STREET BRIDGE 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 D11)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 8-2011

OSBORNE STREET BRIDGE 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 (1993 Revision), International Chamber of Commerce Publication Number 500.

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D12)
OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

Name	Address
PART A/C: BRIDGE WORK	
SUPPLY OF MATERIALS:	
Black Reinforcing Steel	
Stainless Steel Reinforcing	
Structural Concrete	
High Performance Concrete (HPC) Overlay	
Sidewalk Wearing Surface Concrete (WSC) Overlay	
Galvanized Dowels & Expansion Sleeves	
Expansion Joints	
Aluminum Pedestrian Handrail	
Aluminum Art Balusters	
Aluminum Art Gateway Panels	
Stainless Steel Art Sidewalk Strips	
Galvanized Steel Deck Drains	
Granular Backfill	
Asphaltic Concrete Overlay	
CONSTRUCTION/INSTALLATION/PLACEMENT:	
Traffic Control	
Structural Removals	
Bridge Deck Surface Preparation	
Bearing Installation	
Black and Stainless Steel Reinforcing	
Placing Structural Concrete	
Placing High Performance Concrete (HPC) Overlay	
Placing Sidewalk Wearing Surface Concrete (WSC) Overlay	
Expansion Joints	

Concrete Repair
Post Tensioning Tendon Inspection and Repair
Aluminum Pedestrian Handrail
Activated Arc Spray Zinc Corrosion Protection
Electrical and Communications Conduits
Navigation Lighting
Asphaltic Concrete Overlay
PART B/D: ROADWORK
SUPPLY OF MATERIALS:
Drainage Inlets
Base Course and Subbase
Geotextiles
Asphalt
Concrete
Paving Stones
CONSTRUCTION / INSTALLATION / PLACEMENT:
Drainage Inlets
Base Course and Subbase Geotextiles
Asphalt
Concrete
Paving Stones
Drainage Inlets

FORM K: EQUIPMENT
(See D13)

OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

1. Category/type: Rotomill

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type: Hydrodemolition Unit

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type: Moveable Deck Hoarding

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

4. Category/type: Machine for High Performance Concrete (HPC) Overlay Grooving

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type: Mechanical Screed

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type: Excavator

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

7. Category/type: Dozer

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

8. Category/type: Grader

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

9. Category/type: Loader

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

OSBORNE STREET BRIDGE REHABILITATION AND RELATED WORKS

10. Category/type: Compactors

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

11. Category/type: Slip Form Concrete Paver

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

12. Category/type:Asphalt Paver

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

E1.2.3 Further to C2.4(d), Specifications included in the 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
B109-11-006_Sht1	COVER SHEET
B109-11-007_Sht2	DESIGN DATA AND DRAWINGS LIST
B109-11-008_Sht3	SITE PLAN
B109-11-009_Sht4	GENERAL ARRANGEMENT – PLAN AND ELEVATION
B109-11-010_Sht5	DECK PROFILE 1
B109-11-011_Sht6	DECK PROFILE 2
B109-11-012_Sht7	DECK PROFILE 3
B109-11-013_Sht8	GENERAL ARRANGEMENT – CROSS SECTIONS
B109-11-014_Sht9	SCOPE OF WORK
B109-11-015_Sht10	CONSTRUCTION STAGING – PHASE 1 - REMOVAL AND CONSTRUCTION 2011
B109-11-016_Sht11	CONSTRUCTION STAGING – BTW 1 & 2 & 2 REMOVAL 2012
B109-11-017_Sht12	CONSTRUCTION STAGING – PHASE 2 & 2A – CONSTRUCTION 2012
B109-11-018_Sht13	OVERALL LAYOUT AND BEARING DATA
B109-11-019_Sht14	NORTH AND SOUTH ABUTMENTS – BEARING DETAILS
B109-11-020_Sht15	PIER 1 AND 3 – BEARINGS DETAILS
B109-11-021_Sht16	PIER 2 – BEARING DETAILS
B109-11-022_Sht17	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 REMOVAL
B109-11-023_Sht18	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 REMOVAL
B109-11-024_Sht19	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-025_Sht20	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-026_Sht21	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-027_Sht22	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-028_Sht23	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-029_Sht24	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-030_Sht25	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1A REMOVAL
B109-11-031_Sht26	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1A CONSTRUCTION
B109-11-032_Sht27	NORTH ABUTMENT AND APPROACH SLAB – PHASE 1A REINFORCING
B109-11-033_Sht28	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 REMOVAL
B109-11-034_Sht29	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 REMOVAL
B109-11-035_Sht30	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 CONSTRUCTION
B109-11-036_Sht31	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 CONSTRUCTION

B109-11-037_Sht32	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-038_Sht33	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-039_Sht34	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-040_Sht35	NORTH ABUTMENT AND APPROACH SLAB – PHASE 2A CONSTRUCTION
B109-11-041_Sht36	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 REMOVAL
B109-11-042_Sht37	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 REMOVAL
B109-11-043_Sht38	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-044_Sht39	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-045_Sht40	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 CONSTRUCTION
B109-11-046_Sht41	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-047_Sht42	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-048_Sht43	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1 REINFORCING
B109-11-049_Sht44	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1A REMOVAL
B109-11-050_Sht45	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1A CONSTRUCTION
B109-11-051_Sht46	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 1A REINFORCING
B109-11-052_Sht47	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 REMOVAL
B109-11-053_Sht48	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 REMOVAL
B109-11-054_Sht49	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 CONSTRUCTION
B109-11-055_Sht50	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 CONSTRUCTION
B109-11-056_Sht51	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 CONSTRUCTION
B109-11-057_Sht52	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-058_Sht53	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-059_Sht54	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2 REINFORCING
B109-11-060_Sht55	SOUTH ABUTMENT AND APPROACH SLAB – PHASE 2A CONSTRUCTION
B109-11-061_Sht56	BRIDGE DECK – PHASE 1 REMOVAL
B109-11-062_Sht57	BRIDGE DECK – PHASE 1 REMOVAL DETAILS
B109-11-063_Sht58	POST TENSIONING TENDONS – INSPECTION AND REPAIRS
B109-11-064_Sht59	POST TENSIONING TENDONS – INSPECTION AND REPAIRS
B109-11-065_Sht60	BRIDGE DECK – PHASE 1 CONSTRUCTION
B109-11-066_Sht61	BRIDGE DECK – PHASE 1 CONSTRUCTION
B109-11-067_Sht62	BRIDGE DECK – PHASE 1 CONSTRUCTION
B109-11-068_Sht63	BRIDGE DECK DRAIN DETAILS – PHASE 1 CONSTRUCTION
B109-11-069_Sht64	BRIDGE DECK – PHASE 1 CONSTRUCTION
B109-11-070_Sht65	BRIDGE DECK – PHASE 1 REINFORCING
B109-11-071_Sht66	BRIDGE DECK – PHASE 1 REINFORCING
B109-11-072_Sht67	BRIDGE DECK – PHASE 1 REINFORCING
B109-11-073_Sht68	BRIDGE DECK – PHASE 2 REMOVAL
B109-11-074_Sht69	BRIDGE DECK – PHASE 2 REMOVAL
B109-11-075_Sht70	PIER CAP & INTERMEDIATE DIAPHRAGM – CONCRETE INFILL PLAN
B109-11-076_Sht71	PIER CAP & INTERMEDIATE DIAPHRAGM – CONCRETE INFILL DETAILS
B109-11-077_Sht72	PIER CAP & INTERMEDIATE DIAPHRAGM – REINFORCING
B109-11-078_Sht73	PIER CAP & INTERMEDIATE DIAPHRAGM – REINFORCING
B109-11-079_Sht74	BRIDGE DECK – PHASE 2 CONSTRUCTION
B109-11-080_Sht75	BRIDGE DECK – PHASE 2 CONSTRUCTION
B109-11-081_Sht76	BRIDGE DECK – PHASE 2 CONSTRUCTION
B109-11-082_Sht77	BRIDGE DECK – PHASE 2A CONSTRUCTION
B109-11-083_Sht78	BRIDGE DECK – PHASE 2 REINFORCING
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B109-11-085_Sht80	BRIDGE DECK – PHASE 2 REINFORCING

B109-11-086_Sht81	CONCRETE BARRIER LAYOUT
B109-11-087_Sht82	CONCRETE BARRIER – SECTIONS AND DETAILS
B109-11-088_Sht83	CONCRETE BARRIER – REINFORCING DETAILS
B109-11-089_Sht84	ALUMINUM PEDESTRIAN HANDRAIL LAYOUT
B109-11-090_Sht85	ALUMINUM PEDESTRIAN HANDRAIL ELEVATIONS, SECTIONS AND DETAILS
B109-11-091_Sht86	ALUMINUM PEDESTRIAN HANDRAIL SECTIONS AND DETAILS
B109-11-092_Sht87	ALUMINUM PEDESTRIAN HANDRAIL EXPANSION PANEL DETAILS
B109-11-093_Sht88	ALUMINUM PEDESTRIAN HANDRAIL – ART LAYOUT
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B109-11-095_Sht90	ALUMINUM PEDESTRIAN HANDRAIL – ART LAYOUT
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B109-11-099_Sht94	NORTH EXPANSION JOINT – PHASE 1A CONSTRUCTION
B109-11-100_Sht95	NORTH EXPANSION JOINT – PHASE 2 CONSTRUCTION
B109-11-101_Sht96	NORTH EXPANSION JOINT
B109-11-102_Sht97	NORTH EXPANSION JOINT
B109-11-103_Sht98	SOUTH EXPANSION JOINT – PHASE 1 CONSTRUCTION
B109-11-104_Sht99	SOUTH EXPANSION JOINT – PHASE 1A CONSTRUCTION
B109-11-105_Sht100	SOUTH EXPANSION JOINT – PHASE 2 CONSTRUCTION
B109-11-106_Sht101	SOUTH EXPANSION JOINT
B109-11-107_Sht102	SOUTH EXPANSION JOINT
B109-11-108_Sht103	NORTH EXPANSION JOINT – PHASE 1 AND PHASE 1A REINFORCING
B109-11-109_Sht104	NORTH EXPANSION JOINT – PHASE 2 REINFORCING
B109-11-110_Sht105	SOUTH EXPANSION JOINT – PHASE 1 REINFORCING
B109-11-111_Sht106	SOUTH EXPANSION JOINT – PHASE 2 REINFORCING
B109-11-112_Sht107	ACTIVATED ZINC ARC SPRAY DETAILS
B109-11-113_Sht108	SLOPE PAVING
B109-11-114_Sht109	NAVIGATION LIGHTING AND DETAILS
B109-11-115_Sht110	REINFORCING SCHEDULE
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B109-11-117_Sht112	REINFORCING SCHEDULE
B109-11-118_Sht113	BRIDGE LIGHTING AND DETAILS
B109-11-119_Sht114	BRIDGE LIGHTING AND DETAILS
B109-11-120_Sht115	ELECTRICAL ELEVATION, SECTIONS, AND DETAILS
B109-11-121_Sht116	BRIDGE DETAILS AND PANEL SCHEDULE AND LUMINAIRE SCHEDULE

PART B – ROADWORK

B109-11-122_Sht117	CONTROL LINE GEOMETRY
B109-11-123_Sht118	PAVING AND GRADING STA: 0+930 TO 1+075
B109-11-124_Sht119	PAVING AND GRADING STA: 1+075 TO 1+245
B109-11-125_Sht120	PAVING AND GRADING STA: 1+245 TO 1+345
B109-11-126_Sht121	PAVING AND GRADING STA: 1+315 TO 1+485
B109-11-127_Sht122	PAVING AND GRADING STA: 1+455 TO 1+580
B109-11-128_Sht123	PAVING AND GRADING STA: 1+580 TO 1+755
B109-11-129_Sht124	CROSS SECTIONS
B109-11-130_Sht125	DETAILS 1 OF 2
B109-11-131_Sht126	DETAILS 2 OF 2
B109-11-132_Sht127	TRAFFIC STAGING – PHASE 1A
B109-11-133_Sht128	TRAFFIC STAGING – PHASE 1B
B109-11-134_Sht129	TRAFFIC STAGING – PHASE 1C
B109-11-135_Sht130	TRAFFIC STAGING – PHASE 2A
B109-11-136_Sht131	TRAFFIC STAGING – PHASE 2B

REFERENCE DRAWINGS

P.D.NO.75-197	OSBORNE STREET BRIDGE REPLACEMENT ACROSS THE ASSINIBOINE RIVER, RECORD DRAWINGS: COVER SHEET R1; B-5076-

1 R1 TO B-5076-30 R1; B-5076-32 R1 TO B-5076-35 R1.

OSBORNE STREET BRIDGE BEARING SHOP DRAWINGS: E669-1 1 TO 3 R0; E670-1 1 TO 3 R0; E671-1 1 AND 2 R0.

957-2010 SUPPLY, FABRICATION, AND DELIVERY OF BEARINGS: OSBORNE STREET BRIDGE DRAWINGS: B109-11-001 TO B109-11-005

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

(b) The time and date of weighing.

GENERAL REQUIREMENTS

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 Gerald James Lynch Park and the Granite Curling Club. 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. Refer to Appendix C for further information.

E4.5.7 Restoration of Existing Facilities

(a) 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

(a) 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:

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

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

(iii) The office shall be a newer 10 ft by 60 ft trailer or building, 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);

(iv) 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;

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

(vi) The office shall be furnished with three office desks and chairs, one drafting table, one meeting table, one stool, one legal size filing cabinet, two bookcases, and a minimum of twelve (12) chairs;

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

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

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

(x) 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;

(xi) 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;

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

(xiii) 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 B109-11-111 to B109-11-115.

(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 (excluding lane-at-a-time areas). The City shall bear all costs associated with these Works. This includes:

(i) Installation of poly post lane delineation for Northbound and Southbound traffic;

(ii) Lane closures and barricades to facilitate reversible lanes, generally located at the extreme north and south end of the project site;

(iii) Daily movement of barricades and signage to facilitate reversible lanes;

(iv) Turning restrictions and related signage for Osborne Street and side streets;

(v) All regulatory signage;

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

(vii) 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) Lane closures and barricades to facilitate lane-at-a-time construction, notably in the Broadway intersection and at the south limit of the project area;

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

(iv) Installation and adjustment of sidewalk barricades stating "sidewalk closed";

(v) Maintaining access for emergency vehicles to Mostyn Place;

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

(vii) Maintaining at least one pedestrian crossing of Osborne Street at each side street (Broadway, Roslyn, and River);

(viii) 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;

(ix) Lowering concrete base elevation of signal pole at the north median of the Broadway and Osborne Intersection by means of mechanical breaker, placing steel plate to cover pole base and conducting miscellaneous asphalt works to make area traversable for traffic;

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

(xi) 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)	Completion of Phase 1A	10%
(ii)	Completion of Phase 1B	30%
(iii)	Completion of Phase 1C	10%
(iv)	Completion of Phase 2A	30%
(v)	Completion of Phase 2B and 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 north abutment and Pier No. 3 for the Northbound and Southbound Bridges 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) A pedestrian protection wall at the location of the underbridge pathway between the north abutment and Pier No, 3, 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 the pathway enclosure.

(b) The base of the pedestrian protection enclosure shall be elevated such that a minimum elevation of 229.745 m is achieved, to allow access during high water levels.

(c) The pedestrian protection enclosure must be removed no later than October 31, 2011. The pedestrian protection enclosure shall be reinstalled upon commencement of Phase 2 Construction.

(d) 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 Enclosure 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 and abutments;

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

(iv) Removing and disposing of Stage I deck concrete;

(v) Removing and disposing of Stage II deck concrete;

(vi) Removing and disposing of Stage III deck concrete:
  (i) Type 1
  (ii) Type 2
  (iii) Type 3

(vii) Removing the deck drains;

(viii) Removing existing concrete in preparation for installing new deck drains, at the locations shown on the Drawings;

(ix) Removing and disposing of the expansion joints;

(x) Removing and disposing of a portion of the existing abutment backwalls;

(xi) Removing and disposing of the approach slabs;

(xii) Removing and disposing of the precast concrete channel girders at the north abutment approach;

(xiii) Removing the existing navigation lights and maintaining a temporary navigation lighting system;

(xiv) Temporarily relocating and protecting the River Level Monitoring System;

(xv) Permanently removing the existing River Level Monitoring System upon completion of new installation;

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

(xvii) Removing and disposing of concrete encased electrical and communication conduits/ducts;

(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 D28– 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. Refer to Appendix C for Navigable Waters Permit.

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. 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.

(l) Protect the live MTS, Manitoba Hydro and City of Winnipeg cables, and River Level Monitoring System during structural removals. There are three (3) MTS conduits located beneath the west side of the Bridge deck that are to remain live during construction. These conduits will require temporary relocation during structural removals at the abutments and expansion joints. Coordination will be required with MTS for this Work. They are to be maintained live during the entire duration of the Works. Provide full-time temporary protection to the satisfaction of the Contract Administrator. The Contractor will be responsible for the safe condition of the live cables for the duration of the Project. 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.

E8.7.2 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.

(c) A Condition Survey was conducted on the Osborne Street Bridge and is included in Appendix A.

E8.7.3 Sequence of Structural Removals

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

E8.7.4 Removal of Asphalt Overlay

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

(b) Following the removal of the asphalt overlay, the Contractor shall conduct a survey of the exposed concrete Bridge deck as shown on the Drawings. Asphalt overlay thicknesses vary between 52 mm and 91 mm based on asphalt sawn samples taken from the existing Bridge. Refer to Appendix A: Osborne Bridge 2009 Condition Survey for additional information.

E8.7.5 Removal of Handrail

(a) Remove and dispose of the handrail.

E8.7.6 Removal of Sidewalk Slab and Median Concrete

(a) Removal of the concrete sidewalk slab and median shall be to the limits of removals as shown on the Drawings.

(b) The concrete sidewalk slab and median surface shall be removed by using a combination of BobCAT with milling attachment, scraping, and saw cutting.

(c) Removal of this concrete shall be considered incidental to concrete bridge deck overhang and concrete sidewalk slab overhang removals.

E8.7.7 Removal of Bridge Deck Overhangs

(a) Removal of the Bridge deck overhangs shall be to the limits of removals as shown on the Drawings. All concrete to remain shall be fully supported by work platforms.

(b) The deck overhangs shall be removed by saw cutting as shown on the Drawings.

(c) The existing overhang concrete to remain shall be protected and supported during all structural removal operations. There is an existing post tensioning tendon to remain on top of the existing precast concrete girders in the vicinity of the limits of overhang removals. Refer to the Drawings for further details.

(d) Remove existing electrical conduits in overhang. Electrical cables in conduits to be salvaged, by appropriate utility. Coordinate removal of electrical cables with Manitoba Hydro and MTS.

E8.7.8 Removal of Stage I Deck Concrete

(a) Stage I deck concrete removal shall be the removal of the concrete deck to within six (6) mm of the top of the top mat of reinforcing steel, as shown on the Drawings.

(b) Stage I deck concrete removal shall be undertaken by rotomilling. Ensure that the rotomill does not touch and thereby damage any reinforcing steel that is to remain.

(c) The top mat of reinforcing steel is being discarded.

(d) The Drawings show an approximate depth of the top layer of reinforcing steel. It is expected that there will be some variability in the depth of the top layer of reinforcing steel across the entire deck surface.

E8.7.9 Removal of Stage II Deck Concrete

(a) Stage II deck concrete removal shall be the removal of the Bridge deck from the limits of the Stage I deck concrete to the top of the post tensioning ducts, as shown on the Drawings. Concrete removed within this limit shall also include removal of concrete from the top layer of reinforcing steel to the bottom of the top layer of reinforcing steel.

(b) Stage II deck concrete removal shall be undertaken by hydrodemolition.

(c) The top mat of reinforcing steel is being discarded. Remove and dispose of the top longitudinal and transverse layers of reinforcing steel. The Contractor shall ensure

that all other reinforcing steel to remain is not damaged. Any reinforcing steel damaged shall be replaced by the Contractor to the satisfaction of the Contractor at no additional cost to the City.

(d) Existing longitudinal post tensioning tendons are found in the deck concrete over pier locations, as shown on the Drawings. It is expected that there will some variability in the top of the existing post tensioning ducts. The Contractor shall take care to avoid damaging these post tensioning tendons and their protective ducts. If any ducts are damaged or split, they must be protected and kept dry. Existing post tensioning tendons are under tension. The Contractor shall consider the potential of the debonding of the post tensioned tendons during structural removal operations and shall complete all removals keeping this potential in mind. The Contractor shall, as part of their detailed plan, specify the safety precautions that will be undertaken in the event of debonding of the post tensioned tendons.

(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 expense to the satisfaction of the Contract Administrator.

E8.7.10 Removal of Stage III Deck Concrete

(a) As directed by the Contract Administrator, the Contractor shall undertake Stage III deck concrete removals. Stage III deck concrete removals shall be defined by the following types:

(i) Type 1 – Removal of the Bridge deck from the limits of Stage II Deck Concrete to the mid height of the existing top layer of the bottom reinforcing mat;

(ii) Type 2 – Type 1 removal to full depth concrete deck removal; and

(iii) Type 3 – Type 1 removal around post tensioning ducts and tendons.

(b) Existing longitudinal post tensioning tendons are found in the deck concrete over pier locations, as shown on the Drawings. Ducts for post tensioned tendons shall be exposed, as directed by the Contract Administrator. Remove the existing deck slab concrete from approximately the top 1/3 of the circumference for the length of the duct as shown on the Drawings. Clean the duct of all residual tape and sealants. The exposing of ducts shall be used for further inspection and repair, in conjunction with E18, "Post Tensioning Tendons Inspection and Remedial Repair".

(c) During Stage II deck concrete removals, the Contractor shall take care to avoid damaging these post tensioned tendons and their protective ducts. If any ducts are damaged or split, they must be protected and kept dry.

(d) Forming of the deck overhang for Type 2 deck patching Works in accordance with E12.3(a)(x) "Stage II Bridge Deck Slab Works" shall be considered incidental to this Type 2 repair Work.

(e) Removal of Stage III deck concrete shall be conducted by hydrodemolition, or other means as approved by the Contract Administrator.

(f) The bottom mat of reinforcing steel is being saved. The Contractor shall ensure that the reinforcing steel is not damaged. Any reinforcing steel damaged shall be replaced by the Contractor to the satisfaction of the Contract Administrator at no additional cost to the City.

E8.7.11 Bridge Deck Surface Preparation Works

(a) The final surface preparation of the Bridge deck shall be conducted by hydrodemolition, unless otherwise approved by the Contract Administrator. The resulting surface shall achieve the required grades, while being roughened to the following requirements:

(i) For vertical surfaces, concrete vertical surfaces shall be removed by hydrodemolition to a "Medium Scarification" profile, in accordance with the ICRI

Guideline No. 03732, CSP6. For horizontal surfaces, concrete shall be removed by hydrodemolition to a "Scabbled" profile, in accordance with the ICRI Guideline 03732 CSP8.

(b) 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.

(c) 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.

(d) 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.

(e) Bridge deck openings shall be plugged during the hydrodemolition process.

(f) Existing longitudinal post tensioned ducts and strands are found in the deck concrete over pier locations, as shown on the Drawings. During deck surface preparation Works, the Contractor shall take care to avoid damaging these strands and their protective ducts.

(g) The Contractor shall take all necessary precautions to ensure that no sound concrete located below the required depth of removal is damaged or removed. Any damage caused to sound concrete or reinforcing steel beyond the required limit of removal or excessive removal of concrete beyond the required depth of removal by the Contractor during any demolition procedure will be repaired by the Contractor at the Contractor's own expense to the satisfaction of the Contract Administrator.

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

(i) After the hydrodemolition is completed, the deck surface shall be inspected through methods of sounding by the Contract Administrator to ensure that all partial depth 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.

(j) Upon completion of the hydrodemolition of each section of the concrete deck, 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.

(k) There is a possibility that during hydrodemolition blow-throughs of the 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 Bridge deck 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.

(l) 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.

E8.7.12 Screed Survey

(a) The Contractor shall conduct a screed survey of the Bridge deck after all structural removals have been performed as indicated on the Drawings, and submit elevations to the Contract Administrator to ensure that all structural removals have been completed.

(b) The Contract Administrator shall use the results of this survey to provide the final screed elevations for the new deck slab concrete.

(c) The Contract Administrator shall update the Drawings for the Contractor within five (5) Business Days from receipt of the screed survey.

E8.7.13 Removal of Deck Drains

(a) Remove and dispose of the existing deck drains.

(b) Restore the concrete deck around the drains as shown on the Drawings. All restoration and patching materials for this Work shall be approved by the Contract Administrator prior to patching operations. The infill material shall be Type 2 Concrete or EMACO R350CI repair mortar, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”. Plywood for this Work shall be removed following concreting operations.

E8.7.14 Removal of Concrete for New Deck Drains

(a) Remove the existing concrete deck for the installation of new deck drains as shown on the Drawings.

E8.7.15 Expansion Joints

(a) Remove and dispose of the existing Bridge deck expansion joints and seals.

(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.

E8.7.16 Abutment Removals

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

(b) This Work shall include the removal of the cast-in-place concrete traffic barriers mounted on the abutment wingwalls and the abutment backwalls.

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

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

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

(e) 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.

(f) Temporarily relocate the three (3) MTS conduits located beneath the deck for abutment removals during Phase 2 construction. The Contractor shall be responsible for all temporary relocation and protection of these live conduits during all structural removal operations. Coordinate with MTS as required.

E8.7.17 Removal of Approach Slabs

(a) Remove and dispose of the approach slabs.

E8.7.18 Removal of North Abutment Approach Precast Concrete Channel Girders

(a) Remove and dispose of precast concrete channel girders at the north abutment approach to the limits shown on the Drawings.

E8.7.19 Removal of Bridge Street Lighting

(a) Bridge street lighting shall be removed by Manitoba Hydro. The Contractor shall coordinate these removal efforts.

(b) Roadway lights shall be removed by others.

E8.7.20 Removal of Navigation Lighting

(a) Remove existing navigation lighting in the Bridge deck overhangs. Install temporary navigation lighting until completion of installation of new navigation lighting. Temporary lighting must have a minimum illumination of 300 W at each pier location and shall satisfy all requirements of the Navigable Waters Permit. Refer to Appendix C for Navigable Waters Permit.

E8.7.21 Relocation of Existing River Level Monitoring System

(a) Relocate existing River Level Monitoring System prior to removal of the Bridge deck overhangs as shown on the Drawings;

(b) Permanently remove the existing River Level Monitoring System upon completion of the installation of the new River Level Monitoring System. Refer to E24 Bridge Street Lights, Navigation Lights, River Level Monitoring System, and Underbridge Light Fixtures”.

E8.7.22 Waste Handling and Disposal of Removed Materials

(a) Dispose of all surplus and unsuitable material off-site, in accordance with D28, “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.

E8.7.23 Construction Load Limitations for Equipment

(a) Following removal of the top mat of reinforcing steel, and until the completion of the deck slab and sidewalk slab concrete, equipment travelling across the deck shall be limited to a gross vehicle weight of 10,000 kg.

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) Concrete Bridge Deck Overhang and Concrete Sidewalk Slab Overhang;
(iv) Deck Drains;
(v) Preparation for New Deck Drains;
(vi) Expansion Joints;
(vii) Approach Slabs;
(viii) Abutments;
(ix) North Abutment Approach Precast Concrete Channel Girders; and
(x) Navigation Lights.

E8.9.2 Structural Removals: Stage I Deck Concrete

(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) Stage I Deck Concrete.

E8.9.3 Structural Removals: Stage II Deck Concrete

(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) Stage II Deck Concrete.

E8.9.4 Structural Removals: Stage III Deck Concrete

(a) Structural removals shall be paid for at the Contract Unit Price per square 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 performing all operations herein described and all other items incidental to the Work. The area to be paid for shall be the total concrete removed as directed and measured by the Contract Administrator.

(b) Items of Work:

(i) Structural Removals: Stage III Deck Concrete

(a) Type 1;

(b) Type 2; and

(c) Type 3.

E8.9.5 Bridge Deck Surface Preparation

(a) Bridge deck surface preparation shall not be measured. This Work shall be paid for a the Contract Lump Sum Price for "Bridge Deck Surface Preparation", 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.

E8.9.6 Relocate and Remove River Level Monitoring System

(a) The temporary relocation and permanent removal of the River Level Monitoring System shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Relocate and Remove River Level Monitoring System" , 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.

E8.9.7 Temporary Relocation of Live MTS Conduits

(a) Temporary relocation of the live MTS Conduits shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Temporary Relocation of Live MTS Conduits", 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.

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.

(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 north and south abutments;

(ii) Supplying and placing granular backfill for the north and south approach slabs;

(iii) Supplying and placing granular backfill for abutment modification Work at the north and south abutment backwalls;

(iv) Supplying and placing granular backfill around the electrical conduits from the abutment backwalls and the approach sidewalk slabs to the manholes;

(v) Supplying and placing granular backfill for the approach sidewalk slabs;

(vi) Supplying and placing for slope paving protection as part of E22 “Slope Paving Protection”; and

(vii) 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) 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.

(d) 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.

(e) 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:

(i) 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 black and stainless reinforcing steel, and associated bar accessories, as specified herein and as shown on the Drawings.

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

E11.2 Referenced Specifications and Drawings

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

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

(ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;

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

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

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

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

E11.3 Scope of Work

(a) The Work under this Specification shall involve supplying and installing all black and 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 for the sidewalk for the underbridge pathway at the north abutment shall be black steel as shown on the Drawings and shall conform to the requirements of CAN/CSA G30.18, Grade 400W.

(c) All other 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.

(d) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel.

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

TABLE 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	S31803
Type XM-28	XM-28	S24100

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) Black, soft-annealed 1.6 mm diameter wire for black steel reinforcing;

(ii) Nylon-, epoxy-, or plastic-coated wire for black steel reinforcing; and

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

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

E11.5.6 Mechanical Splices

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

E11.5.7 Bonding Agent/Grout

(a) Epoxy resin shall be conform to the requirementsof ASTM C881. Type I or Type IV, Grade 3 epoxy shall be used for bonding reinforcing steel into hardened concrete. An

approved product is Hilti RE500 or equal, as approved by the Contract Administrator in accordance with B6 “Substitutes”.

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

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

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

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

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

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.

E11.7.3 Placing and Fastening of Reinforcing Steel

(a) General

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

(ii) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous

pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

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

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

(v) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. 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.

E11.7.4 Splicing

(a) General

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

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

E11.7.5 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 Black Reinforcing Steel

(a) Supplying and placing black reinforcing steel shall be paid for at the Contract Unit Price per kilogram for "Supply and Place Black Reinforcing Steel", 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 reinforcing steel 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 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.

E11.10.3 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) Stage I Bridge Deck Works

(i) Stage I Bridge deck Works shall comprise of the new concrete deck slab falling within the limits of Stage I and II concrete removals up to the top of the new Bridge deck. Stage I Works shall also comprise of the construction of the new concrete Bridge deck overhangs.

(ii) Bridge Sidewalk Slab Works:

(i) Bridge sidewalk slab Works shall comprise of the new cast-in-place concrete sidewalk slabs and curbs on each Bridge deck overhang.

(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 and on the abutment wingwalls.

(iv) North Abutment Slab

(i) North abutment slab Works shall comprise of the new cast-in-place concrete slab.

(v) 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 E19.7.4.

(vi) 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.

(vii) Roadway Slab Works:

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

(viii) Abutment Modification Works:

(i) Abutment modification Works shall comprise of all new cast-in-place concrete modifications to the north and south abutments as well modifications to the wingwalls, and the southwest retaining wall.

(ix) Pier Cap Modification Works

(i) Pier cap modification Works shall comprise of all new cast-in-place concrete modifications involved in the joining together of the Northbound and Southbound Bridge concrete pier caps, Bridge deck, and intermediate diaphragms.

(x) Stage II Bridge Deck Slab Works

(i) Stage II Bridge deck slab Works shall comprise the new cast-in-place concrete deck falling within the limits of excavation of Stage III concrete removals, Type 1 and Type 2, in accordance with E8.7.10 “Removal of Stage III Concrete”.

(xi) Slope Paving Protection

(i) Slope paving protection shall comprise of the new cast-in-place concrete pavement slab and for the underbridge pathway at the north abutment.

(xii) Navigable Waters Protection Program

(i) All structural concrete Works shall satisfy the requirements of the Navigable Waters Protection Program. Refer to Appendix C for the Navigable Waters Permit.

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) The Contractor shall design false work, formwork and shoring for the new Bridge deck slab overhangs to be released prior to the placement of the High Performance Concrete (HPC) overlay. The formwork shall not extend beneath the underside of the girders.

(ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(iii) 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.

(iv) 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.

(v) 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.

(vi) As a minimum, the following spacings shall apply, for studding and waling:

(vii) 20-mm plywood: studding 400 mm centre to centre (max.),

(viii) Walers 760 mm centre to centre (max.)

(ix) 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.

(x) 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.

(xi) 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.

(xii) Shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.

(xiii) 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.

(xiv) 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.

(xv) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.

(xvi) 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.

(xvii) 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 Moveable Deck Hoarding

(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 the deck slab concrete work on site, Shop Drawings showing the fabricated details of the movable deck hoarding, design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.

(b) The movable deck hoarding shall be designed by a Professional Engineer registered in the Province of Manitoba and constructed to the following requirements:

(i) Sufficient clearances shall be provided to enable the placing and finishing the deck slab concrete to proceed unhindered inside the hoarding.

E12.4.8 Concrete Deck Slab Pour Sequence and Schedule

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

(b) The Contractor shall submit to the Contract Administrator for review, at least ten (10) Business Days prior to the placement of concrete, details of the construction joints.

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

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.

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, Slope Paving Protection	35 @ 28 Days	C-1	1	20 mm	-	-
Type 2	Deck Slab, Sidewalk Slab and Curbs, and Abutment Modifications.	35 @ 28 Days	C-1	1	20 mm	Corrosion Inhibitor, Synthetic Fibres	0.15
Type 3	North Abutment Slab, Traffic Barriers, Median Barriers, and Approach Slabs	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15
Type 4	Pier Cap Modifications	35 @ 28 Days	C-1	1	14 mm	Synthetic Fibres, Self-Consolidating	0.15

E12.5.4 Working Base Concrete

(a) Working base concrete shall be placed in the locations as shown on the Drawings.

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 CI or F and the substitution shall not exceed 30% by mass of cement.

(d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious

materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

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 B6, “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 B6, “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 B6, “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 B6, “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 B6, “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 B6, “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 B6, “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 B6, “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 B6, “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 t ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

E12.5.23 Precompressed Foam Joint Filler

(a) Precompressed expanding filler shall be compressed to 20% of its expanded width and be a polyurethane foam, impregnated throughout with a latex modified asphalt. Approved products are “Emseal DSM System” by Emseal Corporation. Manufacturer’s recommended primer and top coat are to be used.

E12.5.24 Low Density Styrofoam

(a) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B6, “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 B6, “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 B6, “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 B6, “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 B6, “Substitutes”.

E12.5.28 Anchor Units for Bridge Street Lighting and Aluminum Pedestrian Handrail

(a) Anchor units for Bridge street lighting shall be preset anchorage assembly DGR-2FS (292 mm BCD).

(b) 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 Galvanized Steel Traffic Barrier Drains

(a) Drains shall be fabricated in accordance with CAN/CSA G40.21, Grade 300W.

(b) The drains 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.

E12.5.31 Galvanized Steel Bridge Deck Drains

(a) Supply and install deck drains at the locations shown on the Drawings.

(b) Deck drains shall be fabricated in accordance with the latest edition and all subsequent editions of CAN/CSA G40-21, Grade 300W.

(c) Deck drains shall be galvanized in accordance with the latest edition and all subsequent revisions of CAN/CSA G164-M92, to a minimum net retention of 610 g/m^2.

(d) 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.

(e) 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.

(f) Restore the concrete deck around the drains as shown on the Drawings. All restoration and patching materials for this Work shall be approved by the Contract Administrator prior to patching operations. The top of the deck drain to be capped during deck slab concreting operations is shown on the Drawings. The infill material is to be Type 2 Concrete or EMACO R350CI repair mortar, or equal as accepted by the Contract Administrator, in accordance with B6. Plywood for this Work shall be removed following concreting operations.

E12.5.32 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

E12.5.33 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 Bridge Deck Concrete

(a) Placing Equipment

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

(b) Screed for Deck Slab Concrete

(i) The Contractor may choose to use a mechanical or non-mechanical screed to strike the surface of the deck slab concrete.

(ii) Screed rails are required and shall be sufficient in number and length to ensure that the concrete cover is maintained and the finished elevation of the deck slab concrete meets the design elevations.

(iii) Screed 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 deck slab concrete shall be considered incidental to the placement of the deck slab concrete. No separate measurement or payment shall be made for this Work.

(c) Moveable Work Bridges for Deck Slab Concrete

(i) At least two moveable Work Bridges will be required (one for finishing operations and one for curing operations), independent of the screeding and finishing machines for the deck slab concrete.

(ii) These moveable Work Bridges shall travel guided on rails supported clear of the finished deck slab.

(iii) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area for the purpose of providing access to the Work Bridge.

(iv) The supply, set up, operation, and takedown of the moveable Work Bridges shall be considered incidental to the placement of the Bridge Deck concrete. No separate measurement or payment shall be made for this Work.

(d) Moveable Deck Hoarding

(i) The moveable deck hoarding shall be constructed on wheels or rollers for ready mobility. Another acceptable method is to have stationary sides, with the roof on wheels or rollers.

(ii) The rail system for the movable deck hoarding can be the same rail system used for the screed and the Work Bridges, subject to the approval of the Contract Administrator.

(iii) The roof of the hoarding shall be checked for damage and water tested before each concrete pour, and all repairs shall be made, as required, before concrete placing will be allowed to begin.

(iv) The hoarding shall not be removed from overtop of a newly completed deck slab without first obtaining permission from the Contract Administrator.

E12.6.4 Placing and Finishing Equipment for Sidewalk Slab Concrete

(a) Sidewalk Slab Hoarding

(i) The sidewalk slab hoarding shall consist of opaque panels which shall be placed over the sidewalk slab following finishing operations to protect concrete until curing blankets can be applied without marring the surface of the concrete.

(ii) The supply, setup, and takedown of the sidewalk slab hoarding shall be considered incidental to the placement of the sidewalk slab concrete. No separate measurement or payment shall be made for this Work.

E12.6.5 Placing and Finishing Equipment for Approach Slab Concrete

(a) Mechanical Screed for Approach Slab Concrete

(b) The mechanical screed shall be:

(i) Constructed to span the full width of the approach slab being placed;

(ii) Supported on screed rails positioned above the surface being screeded;

(iii) Sufficiently strong (truss type) to retain its shape under all working conditions, especially if any Work scaffolds are supported on the same screed rails;

(iv) Capable of producing the required flatness tolerance as specified in Clause E13.8.7, “Surface Flatness Requirements”.

(v) The supply, setup, operation, and takedown of the movable mechanical screed shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.

(c) Movable Work Bridge for Approach Slab Concrete Works

(i) The Contractor shall provide a movable Work Bridge, spanning the approach slab at right angles to the centreline of roadway in order to facilitate a broom finish, the application of curing compound, the inspection of the freshly-placed concrete, and any remedial Work required to be done to the screeded surface, including filling in any holes left by the screed bars. After the surface has been screeded, all further Work that may be required shall be done from the Work Bridge.

(ii) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area, as required, for the purpose of providing safe access to the Work Bridge.

(iii) The supply, setup, operation, and takedown of the movable Work Bridge shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.

E12.6.6 Construction Load Limitations for Equipment

(a) Following removal of the top mat of reinforcing steel and until the completion of the deck slab concrete, equipment travelling across the deck shall be limited to a gross vehicle weight of 10,000 kg.

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. Refer to Appendix C for the Navigable Waters Permit.

(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) All forms shall be of wood, metal or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the girders.

(iv) The false work, formwork, and shoring for these Works shall be released prior to placement of the HPC overlay.

(v) 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.

(vi) 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.

(vii) 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.

(viii) 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.

(ix) Shores shall be provided 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 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.

(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 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 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, E12.7.20, “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 Bridge Deck Screeds

(a) Setting Deck Screeds

(i) The Contractor shall adjust screeds to maintain uniform 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, the backup rod, and the flexible joint sealant shall be undertaken as shown on the Drawings.

(ii) 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.

(iii) 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..

(iv) All joint sealing of Bridge traffic barriers shall take place prior to casting the HPC overlay and sidewalk WSC overlay.

(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 Bridge Street Lighting and 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 E20, "Aluminum Pedestrian Handrail, Art Balusters, and Art Gateway Panels".

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 Galvanized Steel Bridge Traffic Drains

(a) All galvanized steel bridge traffic drains shall be installed as shown on the Drawings.

(b) Drains shall be held securely in place so as not to become displaced during concrete placement operations.

E12.7.9 Galvanized Steel Bridge Deck Drains

(a) Galvanized steel bridge deck drains shall be installed as shown on the Drawings.

(b) Drains shall be held securely in place so as not to become displaced during concrete placement operations.

E12.7.10 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 E22.1 "LED Lighting for Aluminum Pedestrian Handrails, Art Balusters, and Art Gateway Panels" and E24 "Bridge Street Lights, Navigation Lights, River Level Monitoring System, Underbridge Light Fixtures", and E25 "Electrical Conduits".

E12.7.11 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.

E12.7.12 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.

E12.7.13 Structure Identification Date

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

E12.7.14 Abutment Modification Works

(a) Abutment modification Works include the modifications to the north and south abutment back wall, wingwalls, and southwest retaining wall, to the limits as shown on the Drawings.

(b) 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.

(iii) The application of dampproofing shall be incidental to abutment modification Works.

E12.7.15 Pier Modification Works

(a) Pier modification Works include the joining together of the Northbound and Southbound concrete piers, Bridge deck, and intermediate diaphragms as part of Phase 2 Construction, as shown on the Drawings.

(b) For final surface preparation of the existing concrete pier caps and diaphragms to be cast against new concrete, the surface shall achieve the required grades, while being roughened to the following requirements:

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

E12.7.16 North Abutment Slab

(a) North abutment slab Works shall include a new cast-in-place concrete slab at the north abutments, to the limits as shown on the Drawings.

E12.7.17 Approach Slab Works

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

E12.7.18 Roadway Slab Works

(a) The Contractor shall undertake the roadway slab Works to the limits as shown on the Drawings.

E12.7.19 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.

E12.7.20 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.

E12.7.21 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 Deck Slab Screed Machine

(i) The Contractor shall conduct a dry run of the screed machine in the presence of the Contract Administrator to verify that the screed supporting rails are properly set to ensure compliance with the specified longitudinal and transverse deck grades. Sufficient screed supporting guide rails to provide the required coverage for the entire pour, as approved by the Contract Administrator, shall be set out and adjusted for height at least one (1) Working Day prior to the proposed pour. The Contract Administrator will verify that the screed machine and screed rails have been adjusted so that the height of the screed above the existing concrete at each point meets the requirements. To confirm the Contractor's adjustments of the machine and screed rails, the screed machine shall be "dry run", and screed clearance measurements taken at each support point by the Contractor. Resetting of the machine and/or screed rails shall be done by the Contractor as required by the Contract Administrator.

(c) Placing Structural Concrete

(i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 $kg/m^2/h$. 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.

E12.7.22 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.

(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 E12.7.25 “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.

E12.7.23 General Curing Requirements

(a) Refer to E12.7.26, “Cold Weather Concreting” for cold weather curing requirements and E12.7.27, “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 deck slab concrete, apply fog misting until the concrete has enough strength to support the placement of the pre-dampened curing blankets. The misting device shall not be used to apply water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water. Failure to apply wet curing blankets within 40 minutes after the 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 E12.7.23(e).

(j) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly.

(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.

E12.7.24 Form Removal

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.

(b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.

(c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for abutments shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads. Bridge deck overhang forms shall be loosened and may be removed prior to placement of the HPC overlay. Stripping of these forms shall not be permitted until a concrete strength of 28 MPa has been achieved by the deck slab concrete and the concrete Bridge traffic barriers.

(d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E12.7.25 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.

E12.7.26 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.

E12.7.27 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 1.2	 10 5	 27 25

E12.7.28 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:

(i) Supply and Place Structural Concrete

(i) Stage I Bridge Deck;
(ii) Bridge Sidewalk Slab;
(iii) Bridge Traffic Barriers;
(iv) North Abutment Slab;
(v) Expansion Joint Dams;
(vi) Approach Slabs;
(vii) Roadway Slabs;
(viii) Abutment Modifications;
(ix) Pier Cap Modifications; and
(x) Slope Paving Protection.

(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 Stage II Deck Concrete

(a) Where Stage III deck concrete removals took place, Stage II Deck Concrete shall be paid for at the Contract Unit Price per square 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:

(i) Supply and Place Structural Concrete

i. Stage II Bridge Deck

(a) Type 1; and
(b) Type 2.

E12.9.3 Moveable Deck Hoarding

(a) Supplying, setting up, operating, and removing of the moveable deck hoarding shall not be measured. The Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Moveable Deck Hoarding for Deck Slab Concrete", 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 incidental to the Work.

E12.9.4 Anchor Units for Bridge Street Lights and 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 Bridge Street Lights and

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.

E12.9.5 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.

E12.9.6 Galvanized Steel Bridge Traffic Barrier Drains

(a) Supplying and installing galvanized steel Bridge traffic barrier drains shall be paid for at the Contract Unit Price for "Supply and Install Steel Bridge Traffic Barrier Drains", 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.

E12.9.7 Galvanized Steel Bridge Deck Drains

(a) Supplying and installing galvanized steel Bridge deck drains shall be paid for at the Contract Unit Price per unit for "Supply and Install Galvanized Steel Bridge Deck Drains", 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. HIGH PERFORMANCE CONCRETE (HPC) OVERLAY

E13.1 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 High Performance Concrete (HPC) Overlay 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.

E13.2 Referenced Specifications and Drawings

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

(i) ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete;

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

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

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

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

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

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

(viii) ASTM C1609 – Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third Pont Loading);

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

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

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

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

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

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

(xv) 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 the HPC overlay Works, placed on top of the Stage I and II deck concrete.

E13.4 Submittals

E13.4.1 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.

E13.4.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for the HPC overlay that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlined on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump). If pumping 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 CAN/CSA A23.1 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of the 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 any necessary adjustments.

E13.4.3 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 Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6, Section 16, Fibre Reinforced Structures, Clause 16.6. Testing for R_i of concrete shall be completed in accordance with E13.8.5(e).

(iii) Testing for air void system shall be completed in accordance with E13.8.5(c).

(iv) Testing for rapid chloride permeability shall be completed in accordance with E13.8.5(f).

(v) Testing for shrinkage strain shall be completed in accordance with E13.8.5(f).

(vi) 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 Method 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 Method 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.

E13.4.4 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.

E13.4.5 Moveable Deck Hoarding

(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 the HPC overlay work on site, Shop Drawings showing the fabricated details of the movable deck hoarding, design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.

(b) The movable deck hoarding shall be designed by a Professional Engineer registered in the Province of Manitoba and constructed to the following requirements:

(i) Sufficient clearances shall be provided to enable the placing and finishing the HPC overlay to proceed unhindered inside the hoarding;

(ii) The minimum length of the hoarding shall be 25 m or the length of the structure, whichever is shorter;

(iii) The hoarding shall have a clear, unsupported span of at least the clear deck width, plus room for all of the screeding and finishing operations;

(iv) The roof and sides of the hoarding shall be covered with waterproof and insulated material, with all joints overlapping and rendered waterproof and not subjected to heat loss. The material shall be strong enough to withstand the force of "driving" rain or snow, and at least two thirds of the roof and the entire sides shall be opaque in order to prevent the deck concrete from being exposed to direct sunlight;

(v) The sides of the hoarding at the junction of the hoarding with the deck shall be constructed to prevent the entrance of rain from the sides. Provisions shall be made for enclosing the ends of the hoarding on short notice in the event that closing of the ends proves necessary during the concrete placing operations; and hoarding shall be constructed on wheels or rollers for ready mobility.

Another acceptable method is to have stationary sides, with the roof on wheels or rollers.

E13.4.6 HPC Overlay Pour Sequence and Schedule

(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 the HPC overlay placement:

(i) The proposed sequence of construction for the placement of the HPC overlay.

(b) The Contractor shall submit to the Contract Administrator for review, at least ten (10) Business Days prior to the placement of concrete, details of any proposed construction joints.

(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 concrete placement, the proposed placement schedule for the HPC overlay.

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 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 E13.1.

TABLE E13.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength MPa	Class of Exposure	Air Content Category	Max AggregateSize	Special Requirements	Minimum Post Residual Cracking Index
Type 5	High Performance Concrete (HPC) Overlay	50 @ 56 Days	C-XL	1	14 mm	Crushed Granite Aggregate; Synthetic Fibres; maximum Shrinkage Strain of 450 microstrains @ 56 Days;	0.15

E13.5.4 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 CAN/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 A23.2-14A or 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 – Granite

(i) Only coarse crushed granite aggregate shall be used for the HPC overlay.

(ii) Coarse aggregate shall be 100% crushed, washed granite, low in quartz, clean and free from alkali, organic, or other deleterious matter, shall have two fractured faces, and shall have an absorption not exceeding 3%.

E13.5.5 Admixtures

(a) Air-entraining admixtures shall conform to the requirements of ASTM C260.

(b) Chemical admixtures shall conform to the requirements of 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.

E13.5.6 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

(b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed 30% by mass of cement.

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

E13.5.7 Water

(a) Water to be used for all operations in the Specification, including the 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.

E13.5.8 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene as accepted by the Contract Administrator, or 100% virgin polyolefin. 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 with the Canadian Highway Bridge Design Code, CAN/CSA-S6, Section 16, Fibre-Reinforced Structures, Clause 16.6.

E13.5.9 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 B6, “Substitutes”.

E13.5.10 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”. Polyvinyl acetate-based latexes will not be permitted.

(b) Bonding Grout

(i) grout for bonding the HPC overlay to the new concrete deck slab shall be mixed in an agitating hopper slurry pump and shall consist of the following constitutes, by weight:

i. 1 part Water;

ii. 1 part latex bonding agent; and

iii. 1 $^1/_2$ parts Type GUSF Portland Cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed onto the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E13.5.11 Miscellaneous Materials

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

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.

E13.6.2 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, 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.

E13.6.3 Finishing Machine for the HPC Overlay

(a) Unless otherwise specified, an approved finishing machine complying with the following requirements shall be used.

(b) A mechanical strike-off shall be required to provide a uniform thickness of concrete in front of the screed.

(c) Design of the finishing machine, together with appurtenant equipment, shall be such that positive machine screeding to the plastic concrete will be obtained with 25 mm of at least 150 mm beyond the line where a sawcut is intended to form the edge of a subsequent placement section and shall overlap the sawn edge of a subsequent placement section and shall overlap the sawn edge of a previously-placed course at least 150 mm.

(d) Finishing machines that are approved for use for placing the HPC overlay are Bidwell Bridge Pavers and Gomaco Bridge Pavers.

(e) The finishing machine shall have a paving carriage with strike-off auger, rotating cylinders, and a finishing pan.

(f) The finishing machine shall be capable of forward and reverse motion under positive control. Provision shall be made for raising the screeds to clear the screeded surface for travelling in reverse.

(g) Supporting rails upon which the finishing machine travels will be required on all pours. The support of these rails shall be fully adjustable to obtain the correct profile.

(h) When placing concrete in a lane abutting a previously completed lane, the side of the finishing machine adjacent to the completed lane shall be equipped to travel on the completed lane.

(i) Vehicles for transporting fresh concrete from the truck to the mechanical screed shall not travel directly on the surface of the new concrete deck slab.

(j) The supply, set up, operation, and takedown of the finishing machine shall be considered incidental to the placement of the HPC overlay and no separate measurement or payment shall be made for this Work.

E13.6.4 Moveable Deck Hoarding

(a) The moveable deck hoarding shall be constructed on wheels or rollers for ready mobility. Another acceptable method is to have stationary sides, with the roof on wheels or rollers.

(b) The rail system for the movable deck hoarding can be the same rail system used for the finishing machine and the Work Bridges, subject to the approval of the Contract Administrator.

(c) The roof of the hoarding shall be checked for damage and water tested before each concrete pour, and all repairs shall be made, as required, before concrete placing will be allowed to begin.

(d) The hoarding shall not be removed from overtop of a newly completed HPC overlay without first obtaining permission from the Contract Administrator.

E13.6.5 Moveable Work Bridges for HPC Overlay

(a) At least two moveable Work Bridges will be required (one for finishing operations and one for curing operations), independent of the finishing machine, for the HPC overlay Works.

(b) These moveable Work Bridges shall travel guided on rails supported clear of the finished Bridge deck.

(c) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area for the purpose of providing access to the Work Bridge.

(d) The supply set up, operation, and takedown of the moveable Work Bridges shall be considered incidental to the placement of the Bridge Deck concrete. No separate measurement or payment shall be made for this Work.

E13.7 Construction

E13.7.1 HPC Overlay

(a) General

(i) The HPC overlay shall be constructed in accordance with the requirements of this Specification.

(ii) The new deck concrete, and any patching repairs thereto, shall reach a minimum compressive strength of 35 MPa, as determined by field-cured test cylinders, before the HPC overlay is placed.

(b) Surface Preparation

(i) Following the completion of the deck concrete, the Contractor shall conduct a final screed survey on the top of the concrete and submit elevations to the Contract Administrator.

(ii) The Contract Administrator shall finalize and provide elevations for the top of the HPC overlay. The Contract Administrator shall provide these elevations for the Contractor within five (5) Business Days from receipt of the final screed survey.

(iii) The new concrete deck surface, onto which the HPC overlay concrete is to be placed shall be roughened as per ICRI Guideline No. 03732 CSP 6 (Medium Scarification).

(iv) It is permissible that the concrete surface may be prepared by rotomilling, as approved by the Contract Administrator. The entire rotomilled surface shall receive a high-pressure water blast to remove all surface microfractures to the satisfaction of the Contract Administrator.

(v) The time interval between the surface preparation and the placing of the HPC overlay concrete shall be kept to a minimum, and utmost care shall be taken to keep the prepared surfaces clean during the interval.

(vi) Immediately before proceeding with each HPC overlay concrete placement, the prepared surface shall be inspected for dirt and other deleterious materials that may have been deposited after the completion of cleaning. All such dirt and deleterious material shall be cleaned off in a manner and by procedures satisfactory to the Contract Administrator.

(vii) Placement of the HPC overlay 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. The nomograph, Figure D1, Appendix D of CAN/CSA A23.1 shall be used to estimate surface moisture evaporation rates.

(c) Mixing

(i) A water-reducing admixture for improving Workability will be required. The admixture must be accepted by the Contract Administrator and shall be used in strict accordance with the Manufacturer's instructions.

(d) Dry Run of Finishing Machine

(i) The Contractor is responsible for properly setting the screed supporting rails to ensure compliance with the specified longitudinal and transverse deck grades, without creating potential ponding areas or “bird baths.”

(ii) 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 the day prior to the pour. The Contract Administrator will then check the deck grades, as follows:

i. That the screed supporting rail system upon which the finishing machine will travel has been placed outside the area to be concreted. Arrangements for positive anchorage of supporting rails shall provide for horizontal and vertical stability. Hold-down devices shot into the concrete will not be permitted; and

ii. That the finishing machine and screed rails have been adjusted so that the height of the screed above the existing concrete at each point meets the Contract Administrator's requirements. To confirm the Contractor's adjustment of the machine and guide rails, the finishing 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.

(e) Placing HPC Overlay

(i) No longitudinal or transverse joints will be allowed unless detailed on the Drawings or authorized in writing by the Contract Administrator. Where transverse and longitudinal joints are allowed, the HPC overlay previously placed shall be saw cut full depth to a minimum of 50 mm horizontally back from the formed joint location, to a straight and vertical edge against which the adjacent HPC overlay is to be placed, as approved by the Contract Administrator.

(ii) Immediately before placing the HPC overlay concrete, a thin coating of bonding grout shall be scrubbed into the clean, dry surface of the joint and Bridge deck. Care shall be exercised to ensure that all surfaces receive a thorough, even coating and that no excess of grout is permitted to collect in pockets. The rate of progress in applying grout shall be limited so that the grout does not become dry before it is covered with fresh HPC overlay concrete.

(iii) The Contractor shall take every precaution necessary to secure a smooth-riding HPC overlay surface, within the tolerances indicated in E13.8.7 in this Specification.

(iv) Concrete shall be placed so as to avoid segregation of constituent materials. The concrete finishing machine shall provide sufficient vibration to properly compact the mix. Excess vibration which may cause segregation shall be avoided. If over 75 mm in thickness, or if reinforcing steel is in the lift, the concrete shall be internally vibrated in advance of machine finishing.

(v) The temperature of the concrete shall not be less than 10°C, nor more than 18°C, at the time of placing, and shall be maintained below this maximum temperature by the inclusion of ice in the mix in place of a portion of the mix water, as approved by the Contract Administrator, taking care to maintain the design water/cementitious ratio.

(vi) The overall combination of labour and equipment for proportioning, mixing, placing, and finishing new concrete shall be of such minimum capability as to meet the following requirements, as shown on Table E13.2, "Minimum Requirement for Placing High Performance Concrete (HPC) Overlay", except when noted otherwise on the Drawings.

TABLE E13.2 MINIMUM REQUIREMENT FOR PLACING HIGH PERFORMANCE CONCRETE (HPC) OVERLAY	
TOTAL CONCRETE AREA PER BRIDGE (Square Metre)	**MINIMUM REQUIREMENTS (Cubic Metres/Hour)**
0 - 275	1.0
276 - 410	1.5
411 - 550	2.0
Over 550	2.5

(vii) The finishing machine shall be so designed that, when concrete is mixed and placed at the specified minimum rate, under normal operating conditions, the elapsed time between depositing the concrete and final screeding shall not exceed 30 minutes. Similarly, the placing equipment and operations shall be such that in no case shall the elapsed time between batching of ready-mix concrete and final screeding exceed 90 minutes.

(viii) Placement of the concrete shall be a continuous operation throughout the pour. In the event of equipment breakdown, such that concrete placement is stopped or delayed for a period of 60 minutes or more, further placement shall be discontinued and may resume only after a period of not less than 12 hours. This restriction does not prohibit continuation of placement provided that a gap is left in the lane or pour strip. The gap shall be sufficient in length for the finishing machine to clear the previously placed concrete. The fill-in section shall be placed after a period of not less than 12 hours. The edge of any discontinued overlay shall be saw cut full depth a minimum 50 mm horizontally back from the discontinued joint location, and then shall be chipped out and thoroughly cleaned before placing further HPC overlay concrete.

(ix) Screed guides shall be placed and fastened in position to ensure finishing of 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 the lower lift deck concrete will not be permitted. Plans for anchoring support rails shall be submitted to the Contract Administrator for acceptance. The Contract Administrator's acceptance must be received in writing by the Contractor prior to the installation of any anchorage devices.

(x) The finished Bridge deck grades shown on the Drawings are preliminary only and are subject to revision during construction by the Contract Administrator.

(xi) The HPC overlay shall have a minimum thickness of 50 mm. Actual HPC overlay thickness may be greater. This would be to accommodate field adjustments for camber and deflection, and to accommodate variances in grade of the underlying deck slab.

(xii) The vibratory screed of the finishing equipment shall be moved slowly and at a uniform rate, such that screeding shall be completed in no more than two passes. The screed vibrators shall not be allowed to run except when screeding is actually in progress. The screeded surface shall not be walked on or otherwise damaged.

(xiii) The HPC overlay concrete surface produced behind the finishing machine shall be magnesium floated the minimum amount necessary to ensure that the surface is free from open texturing, plucked aggregate or projecting polypropylene fibres and local projections or depressions, to meet the surface tolerance specified. The Contractor shall ensure that the concrete surface is not overworked, resulting in excessive loss of air entrainment.

(xiv) During the concrete finishing operations, the Contractor shall utilize a 3.05 m (10 ft.) straightedge with a 75 mm (3 inch) semicircular shape, as supplied by

Bidwell Inc., and as accepted by the Contract Administrator. It shall be used both for flattening the plastic concrete surface and for checking and verifying the surface flatness before commencing curing of the surface. The entire surface shall be checked and any areas not within the surface flatness tolerances specified under the Quality Control section of this Specification shall be corrected using the straight edge. Care shall be taken to preserve the crown and cross section of the roadway.

(xv) Upon completion of the straight-edge checking and final floating the joint with any previous pour (or any transverse joints) shall be sealed by the application of the bonding grout.

(f) Curing of the HPC Overlay

(i) Immediately following finishing of the HPC overlay surface, apply fog misting until the concrete has enough strength to support the placement of the predampened 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.

(ii) After the joint painting is completed, the surface shall be promptly covered with a single layer of clean, lightly pre-dampened, curing blanket.

(iii) Care shall be exercised to ensure that the 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 curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, the Contractor shall stop concrete placement operations until the problem is corrected to the satisfaction of the Contract Administrator.

(iv) The predampened curing blankets shall be a temperature of 20°C, ± 5ºC, when applied to the deck.

(v) Failure to apply wet curing blankets within 40 minutes after the HPC overlay 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.

(vi) It is intended that the surface receive a wet curing blanket cure for at least seven (7) days. 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.

(vii) As soon as the HPC overlay surface can be walked on without damaging the surface, as approved by the Contract Administrator, the curing blankets shall be covered with a layer of minimum 4-mil polyethylene film and a layer of insulated tarps (during cold weather) in order to maintain the concrete temperature of 10°C.

(viii) If, in the opinion of the Contract Administrator, curing has not been maintained sufficiently, the curing period will be extended as directed with no additional payment made.

(g) Surface Texturing of the HPC Overlay Surface

(i) Grooves are to be parallel (within 2 mm) and cut perpendicular to traffic flow. Grooves shall only be cut into the HPC overlay surface following the curing.

(ii) Saw cuts shall be 2.5 mm wide, 6 ± 2 mm deep, and spaced 25 mm on centre.

(iii) The area 600 mm from the low side of traffic barriers, and the area 600 mm from the high side of traffic barriers is not to be grooved and the grooves shall all end in a straight line parallel to the face of the traffic barrier.

(iv) Saw cuts shall extend no closer than 200 mm to expansion joints and to any deck drains.

(v) The Contractor shall supply all water for surface texturing operations strictly in accordance with Section E13.5.7 of this Specification. All run-off from grooving operations and suspended solids shall be collected at either end of the Bridge

off the Bridge approach slabs, in collection tanks, passed through several settling and filtration processes before it is discharged into the sewer system. The final effluent shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge into Sewers, for water quality.

(vi) All Work associated with surface texturing shall be considered incidental to the HPC overlay Works specified herein, and no additional measurement or payment shall be made for this Work.

(h) Limitation of Operations

(i) Provisions shall be made to protect the concrete by only casting overlay concrete under good weather conditions. This means that the air temperatures shall be between 5°C and 25°C and the surface moisture evaporation rate is less than 0.75 kg/square metre per hour as determined by CAN/CSA A23.1, Appendix D, “Guidelines for Curing and Protection”. Also, it shall not be raining and no rain forecast for the duration of each pour. The Contract Administrator’s decision in this matter will be final.

E13.7.2 Opening to Traffic

(a) In no case shall traffic or construction equipment be allowed on the HPC overlay until it has reached a minimum of 60% of its design strength, as determined by concrete cylinders.

(b) The Contract Administrator’s decision as to when the concrete shall be opened to traffic shall be final. Prior to opening to traffic the HPC overlay shall be swept clean.

E13.8 Concrete Quality

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.

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

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.

E13.8.3 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 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.

E13.8.4 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 CSA A23.1. An outline of the quality tests is indicated below.

E13.8.5 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 E13.4.2, “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 E13.4.2, “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 test method of the latest edition and all subsequent revisions of ASTM 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 deflection 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.

(f) Testing for shrinkage strain shall take place for HPC overlay in accordance with ASTM C157.

(g) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C, "Sampling Plastic Concrete".

(h) 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".

(i) Compressive strength tests at fifty-six (56) days shall be the basis for acceptance of all concrete supplied by the contractor. For each fifty-six (56) 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.

(j) 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 E13.1, “Requirements for Hardened Concrete**”** 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.

(k) Notwithstanding CSA A23.2, cores taken from the HPC overlay must achieve at a minimum 85% of the specified concrete design strength.

E13.8.6 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.

E13.8.7 Surface Flatness Requirements

(a) The surface of the HPC overlay shall be finished to a flatness tolerance as specified herein. The surface flatness of the finished concrete shall be determined by measuring the elevation difference between equidistant points spaced 305 mm apart, along straight or curved lines running parallel or perpendicular (radial) to the direction of travel on the Bridge deck. An acceptable surface flatness, as measured along any such line on the finished surface, shall have the absolute difference between any two consecutive readings (a reading being the difference in elevation between two consecutive points) not exceeding 5 mm.

(b) At each location(s) where the absolute difference of 5 mm is exceeded, further detailed contour survey(s) shall be conducted by and at the discretion of the Contract Administrator to determine the extent of the area requiring corrective action, all at the Contractor's expense. Corrective measures shall involve immediate removal of the surface in the areas not meeting the specified surface flatness tolerance and/or acceptable rideability, in the judgement of the Contract Administrator, and

replacement of same to a minimum depth of 50 mm, with the perimeter of the area saw-cut to a depth of 25 mm (the cut face to be sloped to key-in the replacement concrete), as directed by the Contract Administrator. If more than 20 percent of the surface is rejected by the Contract Administrator based on the flatness tolerance and/or any other defect, the Contractor shall immediately remove and replace the entire area of the applicable pour.

(c) This criterion will not apply across the crown or at any deck drains, which must be constructed to meet design grades as shown on the Drawings or as directed by the Contract Administrator.

(d) The Contract Administrator shall take readings and determine the acceptability for the surface flatness prior to the opening of the Bridge. The Contractor shall remove and replace the curing blankets, if required by the Contract Administrator, to undertake the necessary flatness testing and shall restore same immediately upon completion of the testing in each area, so as not to significantly disturb concrete curing, to the satisfaction of the Contract Administrator. The Contractor shall clear all materials and equipment from the deck surface during the testing.

E13.9 Measurement and Payment

E13.9.1 High Performance Concrete (HPC) Overlay

(a) Supplying and placing the High Performance Concrete (HPC) Overlay shall not be measured. The Work shall be paid for at the Contract Lump Sum Price for "Supply and Place High Performance Concrete (HPC) Overlay", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E13.9.2 Moveable Deck Hoarding

(a) Supplying, setting up, operating, and removal of the moveable deck hoarding shall not be measured. The Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Moveable Deck Hoarding for High Performance Concrete (HPC) Overlay", 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 incidental to the Work.

E14. SIDEWALK WEARING SURFACE CONCRETE (WSC) OVERLAY

E14.1 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 Sidewalk Wearing Surface Concrete (WSC) Overlay Works, as specified herein and as shown on the Drawings.

(b) The Work shall be completed in coordination with E20 "Aluminum Pedestrian Handrail, Art Balusters, and Art Gateway Panels".

(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 Work as hereinafter specified.

E14.2 Referenced Specifications and Drawings

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

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

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

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

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

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

(vi) ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete;

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

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

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

(x) CAN/CSA W47.1 – Certification of Companies for Fusion Welding of Steel;

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

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

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

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

E14.3 Scope of Work

(a) The Work under this Specification shall involve the WSC overlay Works, placed on top of the sidewalk slab concrete; and

(b) Anchoring and installing all stainless steel art sidewalk strips into the sidewalk WSC overlay, in coordination with the installation of the aluminum art balusters along the length of the aluminum pedestrian handrail.

E14.4 Submittals

E14.4.1 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.

E14.4.2 Concrete Mix Design Requirements

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

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

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

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

(iii) Aggregate source location(s);

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

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

(vi) The limits for slump;

(vii) The limits for air content;

(viii) Colour additives;

(ix) Volume of fibres; and

(x) 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 CAN/CSA A23.1 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of the 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 any necessary adjustments.

E14.4.3 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) 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 Method 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 Method 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.

(d) Submit colour additive from Manufacturer's colour chart or sample chipset and indicate colour additive numbers and required dosage rates.

E14.4.4 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.

E14.4.5 Moveable Deck Hoarding

(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 the sidewalk WSC overlay work on site, Shop Drawings showing the fabricated details of the movable deck hoarding, design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.

(b) The movable deck hoarding shall be designed by a Professional Engineer registered in the Province of Manitoba and constructed to the following requirements:

(i) Sufficient clearances shall be provided to enable the placing and finishing the sidewalk WSC overlay to proceed unhindered inside the hoarding;

(ii) The minimum length of the hoarding shall be 10 m in length of the structure, whichever is shorter;

(iii) The hoarding shall have a clear, unsupported span of at least the clear sidewalk width, plus room for all of the screeding and finishing operations;

(iv) The roof and sides of the hoarding shall be covered with waterproof material, with all joints overlapping and rendered waterproof and not subjected to heat loss. The material shall be strong enough to withstand the force of "driving" rain or snow, and at least two thirds of the roof and the entire sides shall be opaque in order to prevent the WSC overlay from being exposed to direct sunlight;

(v) The sides of the hoarding at the junction of the hoarding with the deck shall be constructed to prevent the entrance of rain from the sides. Provisions shall be made for enclosing the ends of the hoarding on short notice in the event that

closing of the ends proves necessary during the concrete placing operations; and hoarding shall be constructed on wheels or rollers for ready mobility. Another acceptable method is to have stationary sides, with the roof on wheels or rollers.

E14.4.6 Shop Drawings for Stainless Steel Art Sidewalk Strips

(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 any fabrication of the proposed Shop Drawings, showing all fabrication details of the stainless art sidewalk strips. Fabrication shall take place as shown on the Drawings and in coordination with the aluminum art balusters along the length of the pedestrian handrail.

(b) The Contractor shall submit to the Contract Administrator, at least ten (10) Business Days prior to the scheduled commencement of fabrication mill certificates, certifying conformance to the specified material.

E14.5 Materials

E14.5.1 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.

E14.5.2 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.

E14.5.3 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 E14.1.

TABLE E14.1
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 6	Sidewalk Wearing Surface Concrete (WSC) Overlay	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres, Colour Additives	-

E14.5.4 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 A23.2-14A or 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 1.

E14.5.5 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.

E14.5.6 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

(b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed 30% by mass of cement.

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

E14.5.7 Water

(a) Water to be used for all operations in the Specification, including the 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.

E14.5.8 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polyolefin, as accepted by the Contract Administrator.

E14.5.9 Colour Additives

(a) Two colours shall be used as shown on the Drawings. Colour additives shall contain pure, concentrated mineral pigments specially processed for mixing into concrete and complying with the requirements of ASTM C979. Colour additives shall be Outback (10.5 LBS 677) and Cobblestone (12 LBS 860) supplied by Davis Colours, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”. Colour additives containing carbon black are not acceptable unless Supra Instant Black #8084 is used.

E14.5.10 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”. Polyvinyl acetate-based latexes will not be permitted.

(b) Bonding Grout

(i) grout for bonding the HPC overlay to the new concrete deck slab shall be mixed in an agitating hopper slurry pump and shall consist of the following constitutes, by weight:

i. 1 part Water;

ii. 1 part latex bonding agent; and

iii. 1 1/2 parts Type GUSF Portland Cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed onto the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E14.5.11 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 B6, “Substitutes”.

E14.5.12 Curing Compound

(a) Curing compound shall comply with the latest edition and all subsequent editions of ASTM C309 and be approved by the colour additives Manufacturer for use with colour concrete. An approved product is W-1000 clear cure and seal manufactured by Davis Colours, or equal, as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

E14.5.13 Stainless Steel Art Sidewalk Strips

(a) Stainless steel art sidewalk strips shall conform to the requirements of ASTM A276, Type 304.

(b) A protective plastic film shall be placed on all strips until completion of concreting operations.

E14.5.14 Stainless Steel Straps

(a) Stainless steel straps shall conform to the requirements of ASTM A276, Type 304.

E14.5.15 Stainless Steel Shims

(a) Stainless steel shims shall conform to the requirements of ASTM A276, Type 304.

E14.5.16 Miscellaneous Materials

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

E14.6 Equipment

E14.6.1 General

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

E14.6.2 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, 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.

E14.7 Construction Methods

E14.7.1 Installation of the Stainless Steel Art Sidewalk Strips

(a) The stainless steel art sidewalk strips shall be installed as shown on the Drawings.

(b) Stainless steel art sidewalk strips shall be tack welded in place to stainless steel straps to the spacing shown on the Drawings.

(c) Coordinate with the installation of aluminum art balusters to ensure patterning is correctly located and aligned.

(d) Use stainless steel shims to support art sidewalk strips and ensure required profiles are achieved.

(e) Match the top of the stainless steel art sidewalk strip with the top of the finished concrete surface.

(f) Remove protective plastic film from top of WSC overlay surface only after the concrete has hardened.

E14.7.2 Welding for Stainless Steel Art Sidewalk Strips

(a) All welding shall conform to the requirements of CAN/CSA W47.1 and all CWB procedures.

(b) 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 or pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting or pickling.

E14.7.3 WSC Overlay

(a) General

(i) The WSC overlay shall be constructed in accordance with the requirements of this Specification.

(ii) The new sidewalk slab and barrier concrete, and any patching repairs thereto, shall reach a minimum compressive strength of 28 MPa, as determined by field-cured test cylinders, before the WSC overlay is placed.

(b) Surface Preparation of Sidewalk Slab Concrete

(i) The new concrete sidewalk slab, onto which the WSC overlay concrete is to be placed shall be roughened as per ICRI Guideline No. 03732 CSP 6 (Medium Scarification), by abrasive blasting methods.

(ii) The time interval between the surface preparation and the placing of the WSC overlay concrete shall be kept to a minimum, and utmost care shall be taken to keep the prepared surfaces clean during the interval.

(iii) Immediately before proceeding with each WSC overlay concrete placement, the prepared surface shall be inspected for dirt and other deleterious materials that may have been deposited after the completion of cleaning. All such dirt and deleterious material shall be cleaned off in a manner and by procedures satisfactory to the Contract Administrator.

(iv) Placement of the WSC overlay 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. The nomograph, Figure D1, Appendix D of CAN/CSA A23.1 shall be used to estimate surface moisture evaporation rates.

(c) Mixing

(i) A water-reducing admixture for improving Workability will be required. The admixture must be accepted by the Contract Administrator and shall be used in strict accordance with the Manufacturer's instructions.

(d) Dry Run

(i) The Contractor is responsible to ensure compliance with the specified longitudinal and transverse deck grades, without creating potential ponding areas or “bird baths.”

(e) Placing WSC Overlay

(i) Concrete pours shall be separate for each colour of concrete to avoid bleeding of colours. A construction joint shall be installed at the interfaces of the coloured concrete.

(ii) No longitudinal or transverse joints will be allowed unless detailed on the Drawings or authorized in writing by the Contract Administrator.

(iii) Immediately before placing the WSC overlay concrete, a thin coating of bonding grout shall be sprayed onto the clean, dry surface of the sidewalk slab. Care shall be exercised to ensure that all surfaces receive a thorough, even coating and that no excess of grout is permitted to collect in pockets. The rate of progress in applying grout shall be limited so that the grout does not become dry before it is covered with the fresh WSC overlay.

(iv) The Contractor shall take every precaution necessary to secure a smooth-riding WSC overlay surface.

(v) Concrete shall be placed so as to avoid segregation of constituent materials.

(vi) Concrete shall be placed as nearly possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

(vii) 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.

(viii) 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.

(ix) 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.

(x) The temperature of the concrete shall not be less than 15°C, nor more than 25°C, at the time of placing, and shall be maintained below this maximum temperature by the inclusion of ice in the mix in place of a portion of the mix water, as approved by the Contract Administrator, taking care to maintain the design water/cementitious ratio.

(xi) Placement of the concrete shall be a continuous operation throughout the pour. In the event of equipment breakdown, such that concrete placement is stopped or delayed for a period of 60 minutes or more, further placement shall be discontinued and may resume only after a period of not less than 12 hours. This restriction does not prohibit continuation of placement provided that a gap is left in the lane or pour strip. The gap shall be sufficient in length for the finishing machine to clear the previously placed concrete. The fill-in section shall be placed after a period of not less than 12 hours. The edge of any discontinued overlay shall be saw cut full depth horizontally back from the discontinued joint location, and then shall be chipped out and thoroughly cleaned before placing further WSC overlay.

(xii) The WSC overlay shall have a minimum thickness of 50 mm. Actual WSC overlay thickness may be greater. This would be to accommodate field adjustments and to accommodate variances in grade of the underlying sidewalk slab.

(xiii) The WSC overlay concrete surface shall be magnesium floated the minimum amount necessary to ensure that the surface is free from open texturing, plucked aggregate or projecting polypropylene fibres and local projections or depressions. The Contractor shall ensure that the concrete surface is not overworked, resulting in excessive loss of air entrainment.

(xiv) The concrete shall be finished such that it is flush with the top of the stainless steel art sidewalk strips.

(f) Finishing of the WSC Overlay

(i) Finishing shall be so designed that, when concrete is mixed and placed at the specified minimum rate, under normal operating conditions, the elapsed time between depositing the concrete and final screeding shall not exceed 30 minutes. Similarly, the placing equipment and operations shall be such that in no case shall the elapsed time between batching of ready-mix concrete and final screeding exceed 120 minutes.

(ii) The sidewalk WSC overlay shall be broom finished to produce a medium texture in straight lines perpendicular to traffic. Do not dampen brooms.

(g) Curing of the WSC Overlay

(i) Immediately following finishing of the WSC overlay surface, apply curing compound in accordance with the Manufacturer's instructions. Apply curing compound at consistent times to maintain close colour consistency.

(h) Limitation of Operations

(i) Provisions shall be made to protect the concrete by only casting overlay concrete under good weather conditions. This means that the air temperatures shall be between 5°C and 25°C and the surface moisture evaporation rate is less than 0.75 kg/m^2 per hour as determined by the latest edition and all subsequent revisions of CAN/CSA A23.1, Appendix D, "Guidelines for Curing

and Protection". Also, it shall not be raining and no rain forecast for the duration of each pour. The Contract Administrator's decision in this matter will be final.

E14.7.4 Supply of Concrete

(a) All WSC 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. Alternatively, concrete can be supplied in a bagged mix provided that it satisfies the requirements of Table E14.1, "Requirements for Hardened Concrete", concrete mixes shall be completed in accordance with the Manufacturer's installation methods.

(b) All mixing of concrete must meet the provisions of CAN/CSA A23.1, Clause 5.2, Production of Concrete.

(c) Mixing of colour additives shall be in accordance with Manufacturer's recommendations, ensuring uniform dispersion throughout the mixture.

(d) 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 E14.1, "Requirements for Hardened Concrete", no retarders shall be used.

(e) 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.

(f) 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.

E14.8 Concrete Quality

E14.8.1 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.

E14.8.2 Finishing Test Samples

(a) The Contractor shall provide at least three (3) test sample panels for the sidewalk WSC overlay. Sample concrete panels with minimum dimensions of 1.0 m x 1.0 m x 50 mm thick shall be created from Type 6 concrete, complete with stainless steel sidewalk art pieces. The initial set of panels cast and finished shall be as noted herein this Specification and as shown on the Drawings, for review and acceptance by the Contract Administrator. The concrete finish, concrete type, synthetic fibre content, requirement of sealer etc., may be revised by the Contract Administrator prior to casting and finishing test panel sample No. 2 and/or No. 3. The Contract Administrator will provide direction for the final WSC overlay finishing based on the test samples competed. All costs associated with preparing the finishing test sample panels shall be incidental to the Work.

E14.8.3 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.

E14.8.4 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 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.

E14.8.5 Tolerances

(a) Minor variations in appearance of colour concrete, which are similar to natural variations in colour and appearance of uncoloured concrete are acceptable.

E14.8.6 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 CSA A23.1. An outline of the quality tests is indicated below.

E14.8.7 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 E14.4.3, “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 E14.4.3, “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) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C, "Sampling Plastic Concrete".

(d) 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".

(e) 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.

(f) 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 E14.1, “Requirements for Hardened Concrete**”** 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.

E14.8.8 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.

E14.9 Measurement and Payment

E14.9.1 Sidewalk Wearing Surface Concrete (WSC) Overlay

(a) Supplying and placing the Sidewalk Wearing Surface Concrete (WSC) Overlay shall be paid for at the Contract Unit Price per square metre for "Supply and Place Sidewalk Wearing Surface Concrete (WSC) Overlay", 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.

E14.9.2 Stainless Steel Art Sidewalk Strips

(a) Supplying and placing the stainless steel sidewalk art strips shall be paid for at the Contract Unit Price per square metre for "Supply and Install Stainless Steel Art Sidewalk Strips", 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.

E14.9.3 Moveable Deck Hoarding

(a) Supplying, setting up, operating, and removal of the moveable deck hoarding shall not be measured. The Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Moveable Deck Hoarding for Sidewalk Wearing Surface Concrete (WSC) Overlay", 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 incidental to the Work.

E15. REPAIR MISCELLANEOUS AREAS OF CONCRETE

E15.1 Description

(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.

E15.2 Referenced 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.

E15.3 Scope of Work

(a) The Work under this Specification shall involve preparing and repairing concrete on:

(i) The abutment diaphragm concrete;

(ii) The precast concrete girders;

(iii) Repair of existing deck slab overhang concrete;

(iv) Repair of underside of existing decks;

(v) Repair of the north and south abutment seats; and

(vi) Repair of the north approach bearing seats for the new precast concrete channel girders.

(b) Preparing and repairing concrete on other locations of deteriorated concrete.

E15.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any 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.

E15.5.3 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.

E15.5.4 Material for Concrete Repair

(a) General

(i) Concrete repair material may be either one or a combination of concrete repair mortars, conventional concrete or self-compacting 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 B6 “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 Substructure Concrete as specified in Table E12.1.

E15.5.5 Concrete Aggregate

(a) Concrete aggregate shall be in accordance with the requirements of Clauses E12.5.5.

E15.5.6 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 B6, “Substitutes”.

E15.5.7 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 B6, “Substitutes”.

E15.5.8 Water

(a) Water shall be in accordance with the requirements Clause E12.5.8.

E15.5.9 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 B6, “Substitutes”.

E15.5.10 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.

E15.5.11 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 B6, “Substitutes”.

E15.5.12 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 B6, “Substitutes”.

E15.5.13 Galvashield XP Anodes

(a) Zinc anodes shall be Galvashield XP Anodes available from Vecto Corrosion Technologies, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

E15.6 Equipment

E15.6.1 General

(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 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.

E15.7.2 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.

E15.7.3 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.

E15.7.4 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.

E15.8 Quality Control

E15.8.1 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.

E15.8.2 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.

E15.9 Measurement and Payment

E15.9.1 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.

E16. ACTIVATED ARC SPRAY ZINC FOR GALVANIC CORROSION PROTECTION OF REINFORCED CONCRETE

E16.1 Description

(a) This Specification shall cover all operations relating to supplying, installing, and energizing a zinc-based galvanic corrosion protection system onto designated concrete surfaces, including required electrical connections, protection of bearings, materials, testing, and ensuring continuity of the reinforcing steel as outlined in this Specification and 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.

E16.2 Reference Specifications and Drawings

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

(i) ACI 222R – Protection of Metals in Concrete Against Corrosion;

(ii) ASTM B833 – Specification for Zinc Wire;

(iii) ASTM B6 – Standard Specification for Zinc; and

(iv) SSPC – Near-White Blast Cleaning.

E16.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Applying an activated arc spray zinc for galvanic corrosion protection system to the existing precast concrete girders at each end and one metre from each

abutment end, for a total coating of fourteen (14) girders for each construction phase;

(ii) Applying an activated arc spray zinc for galvanic corrosion protection system on each side of the existing and new concrete diaphragms at each abutment end, for a total coating of twelve (12) diaphragms;

(iii) Preparing the concrete surface of girders prior to the application of zinc spray;

(iv) Protecting all bearings in the vicinity of the activated arc spray; and

(v) Ensuring that the minimum thickness of the activated arc spray zinc has been achieved.

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 ten (10) Business Days prior to the commencement of any Work on Site, the qualifications of the National Association of Corrosion Engineers (NACE) - certified Cathodic Protection Technician and certified Cathodic Protection Specialist employed by the activated zinc metalizing technology company. Qualifications shall include a copy of NACE certifications and documentation verifying experience in the installation and testing of galvanic protection systems for reinforced concrete structures.

(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 typical galvanic corrosion protection system installation details and Quality Assurance (QA) and Quality Control (QC) program approved by the Cathodic Protection Technician that includes verification of anode thickness and bond testing. The Contractor shall also submit proposed methods of protecting bearings during application of zinc. Submittal shall be approved by the Contract Administrator prior to any field installations.

(d) 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 qualifications of the personnel operating the zinc metalizing equipment.

(e) 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, the mill certificates for the zinc spray wire.

E16.5 Materials

E16.5.1 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.

E16.5.2 Activated Arc Spray Zinc System

(a) The galvanic cathodic protection shall be Galvanode ASZ+ humectant-activated metallized zinc coating system by:

Vector Corrosion Technologies
474 Dovercourt Drive
Winnipeg, MB
Phone: (204) 489-6300

or approved equal as approved by the Contract Administrator in accordance with B6 “Substitutes”.

(b) The metallized zinc shall be activated using Galvanode Humectant activator solution.

E16.5.3 Zinc Wire

(a) The zinc wire shall be 4.76 mm diameter and have a minimum of 99.99% purity in compliance with ASTM B6 Special High Grade (Z13001) with impurities not to exceed limits established in ASTM B833, Specification for Zinc Wire.

(b) The zinc wire shall be stored in accordance with the Manufacturer's recommendations.

E16.5.4 Humectant

(a) Humectant shall be Galvanode Humectant activator solution or equivalent as approved by the Contract Administrator in accordance with B6 "Substitutes".

E16.5.5 Blasting Abrasive

(a) Blasting abrasive shall be non-metallic and free of corrosion producing contaminants. Sand abrasives shall be oil free. Slag abrasives shall contain no more than 0.1% oil by weight.

E16.5.6 Concrete

(a) Concrete repair materials shall be compatible with the approved galvanic. Compatible repair materisl shall be pre-packaged hydraulic-cement-based mortar or concrete with 28-day moist cured electrical resistivity less than 15,000 ohm-cm. Approved products include Sika Repair 223 w/ water by Sika Corporation and Meadowcrete GPS by W.R. Meadows Inc., or equal as approved by the Contract Administrator in accordance with B6 "Substitutes".

(b) Repair materials containing magnesium phosphate, or high levels of supplementary cementitious materials such as silica fume, ground-granulated blast furnace slag or fly ash may not meet this resistivity requirement. Epoxy mortars or bonding agents shall not be permitted.

E16.5.7 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified or shown on the Drawings, or as approved by the Contract Administrator in accordance with B6 "Substitutes".

E16.6 Equipment

E16.6.1 General

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

(b) Equipment shall be portable electric arc type specifically designed for application of metallized zinc coatings using 4.75mm diameter high purity zinc wire.

E16.7 Construction Methods

E16.7.1 General

(a) The anode placement and spacing shall be as recommended by the Contractor's enlisted NACE specialist and as approved by the Contract Administrator.

(b) The anode units are connected to the reinforcing steel and encased in a concrete with a minimum 50 mm of clear concrete cover over the anode units. After the anodes are installed and encased in concrete, the anodes will provide galvanic protection to the existing reinforcing steel in the deck.

E16.7.2 Technical Assistance

(a) The Contractor shall enlist and pay for a NACE-qualified Cathodic Protection Specialist employed by the activated zinc metalizing technology company to provide the design of distributed anode to be used.

(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) The Cathodic Protection Technician shall coordinate system testing requirements with the Contract Administrator and shall install system instrumentation wiring, conduit, and related devices, at locations approved by the Contract Administrator.

E16.7.3 Surface Preparation of Concrete for Anode Installation

(a) All spalled and delaminated concrete shall be repaired prior to the installation of the galvanic protection system using compatible repair materials in accordance with E15, "Repair of Miscellaneous Concrete". Allow repair materials to cure for a minimum of twenty-eight (28) days or if pull tests demonstrate that sufficient bond can be achieved after a minimum cure of fourteen (14) days. Bond strength to be verified by means of a pull test in accordance with the latest edition and all subsequent revisions of ASTM D4541 to the Manufactuer's required strength.

(b) All oil and grease shall be removed from the concrete before any blast cleaning application is carried out.

(c) In locations to receive the zinc coating, clean the surface of the concrete with light abrasive blasting or other means to remove all corrosion by-products and other materials that may inhibit bonding of the concrete encasement. Surface preparation techniques shall remove sufficient materials while maximizing the amount of cement paste in contact with the zinc coating.

(d) The concrete shall be clean, dry, and dust free prior to application of the zinc coating. Blow the surface clean with dry compressed air and vacuum clean if required prior to application of the zinc coating. Light pressure washing of surface may be required for confined application.

(e) The ambient air temperature, steel reinforcing temperatures, and concrete substrate temperature shall be a minimum of 5 ^{0}C prior to application of the zinc coating.

E16.7.4 Reinforcing Steel Connections

(a) At least one reinforcing steel connection shall be established for every 50 m^2 of concrete surface area. There shall be a minimum of two connections per vertical face to be protected.

(b) Connections shall be established with vertical reinforcing steel. The same reinforcing steel may not be connected to twice per girder end. Connections shall not be established with prestressing strands.

(c) Reinforcing steel connections can be established at locations where steel is exposed by removal of spalled and delaminated concrete. If no exposed steel exists, locate reinforcing steel with rebar locator and chip out or drill concrete to expose steel.

(d) The rebar connection shall consist of 6 mm galvanized threaded rod drilled and tapped into the embedded reinforcing steel. Threaded rod shall be of sufficient length to protrude a minimum of 50 mm from the concrete surface. Connection between the threaded rod and reinforcing steel shall be sealed with 100% solids, non-conductive epoxy such that no part of the connection will be in contact with the concrete when patching is complete.

(e) Electrical continuity should be verified between reinforcing steel connections and reinforcing steel in repaired concrete locations with a multi-meter. Readings greater than 1 mV potential between locations shall indicate discontinuous rebar.

Discontinuous steel should be made continuous permanently by the installation of a continuity bond using continuous steel.

(f) All concrete spall repair and excavations created for reinforcing steel connection shall be repaired with a compatible concrete repair material. Drilled holes may be filled with 100% non-conductive solids epoxy paste.

E16.7.5 Galvanic Anode Installation

(a) Prior to application of zinc, protect bearings so that metalizing will not in any way damage or interfere with the function of the bearings. An acceptable method of protection is blocking with plywood sheets.

(b) Zinc shall not be applied to damp surfaces, or when there is a risk of dew on the surfaces to be coated. Zinc coating shall not commence unless the dry bulb temperature exceeds the wet bulb temperature by more than 3 ^{0}C and the ambient temperature is rising.

(c) Apply the zinc to the surface of dry, prepared, concrete using multiple 3 to 4 mil thick passes with a criss-cross or elliptical pattern until a nominal thickness of 20 mils (508 µm) is achieved.

(d) Install a minimum 100 mm x 100 mm flattened expanded zinc mesh plate at each reinforcing steel connection. The zinc plate shall be bolted to the surface over the threaded reinforcing steel connections using galvanized steel nuts and galvanized washers.

(e) After the plate is tightened in place, an additional layer of zinc is applied at 20 mils (500 µm) thickness over the connection and the zinc mesh plate. Coating shall extend a minimum of 150 mm beyond the edge of the plate in all directions.

E16.7.6 Humectant

(a) After the zinc coating is installed in each area, apply Vector Galvanode Humectant solution to the surface of the zinc coating by brush, roller or spray. Each coat shall be applied and allowed to dry prior to the application of subsequent coats. Coats shall continue to be applied until the total quantity of activator solution applied is 0.1 litre/m^2.

E16.8 Quality Control

E16.8.1 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.

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) The thickness of the zinc coating shall be measured using 50 mm x 50 mm squares of tape applied to the concrete surface prior to the application of zinc coating. The tape sample will be removed after the zinc coating is completed and the tape will peel away from the zinc coating. The thickness of the zinc coating sample will then be measured with a micrometer.

E16.9 Measurement and Payment

E16.9.1 Activated Arc Spray Zinc

(a) Corrosion protection of reinforced concrete shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Activated Arc Spray Zinc Corrosion Protection", 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

E17. BEARING REPLACEMENT

E17.1 Description

(a) This Specification shall cover coordinating the supply and the installation of twelve (12) disc bearings and twenty-eight (28) steel reinforced elastomeric bearings and their connection assemblies as shown on the Drawings to replace the existing bearings for the Osborne Street Bridge. Bearing types have been designated by their appropriate mark number, as shown on the Drawings. The supply of bearings is covered in Bid Opportunity 957-2010, Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge.

(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.

E17.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Coordinating the bearing delivery and providing for the off-loading, handling, and storage of the bearings with the Contractor of Bid Opportunity 957-2010 – Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge;

(ii) Coordinating the bearing inspection and Fabrication and Installation Guarantee with the Contractor of Bid Opportunity 957-2010, Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge;

(iii) Complying with all the requirements of the Navigable Waters Protection Program; and

(iv) Jacking and shoring as required to raise the Bridge, remove the existing bearings, prepare the attachments, and install the new bearings.

E17.3 Referenced Specifications and Drawings

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

(i) CAN/CSA-G40.20/21 – General Requirements for Rolled or Welded Structural Steel /Structural Quality Steel;

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

(iii) CAN/CSA W48 – Filler Metals and Allied Materials for Metal Arc Welding;

(iv) CAN/CSA W59 – Welded Steel Construction (metal Arc Welding) (Metric Version);

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

(vi) ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels; and

(vii) ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/1 05 ksi Minimum Tensile Strength.

(b) The City of Winnipeg, Bid Opportunity No. 957-2010, Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge.

E17.4 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 the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the commencement of any scheduled Work on site, a signed and sealed by a Professional Engineer registered in the Province of Manitoba for their proposed jacking, temporary shoring, and bearing replacement procedures.

E17.5 Materials

E17.5.1 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.

E17.5.2 Galvanizing Touch-up and Field Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metalizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780 for “Repair of Damaged Hot-Dip Galvanized Coatings.”

(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 Thermocoate Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E17.5.3 Welding Consumables

(a) Welding consumables for field welding shall be certified by the manufacturer as complying with the requirement of CSA Standard W59 and the following specifications:

(i) Manual shielded metal-arc welding (SMAW):

(i) All electrodes for the manual, shielded metal-arc welding process shall conform to CSA W48.1, CSA G48.3 classification E480XX or imperial equivalent.

(ii) Gas, Metal Arc Welding (GMAW):

(i) All electrodes used in the gas, metal arc-welding process shall be composite electrodes conforming to CSA G48.4 classification ER480S-X or imperial equivalent.

(iii) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.

(iv) Submerged Arc Welding (SAW):

(i) Welding electrodes and fluxes used in the submerged arc welding process shall conform to CSA W48.6 classification F480X-EXXX or imperial equivalent.

(v) All electrodes, wires and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -30^0C as outlined in the various codes mentioned above.

(a) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for his acceptance at least twenty-one (21) days prior to the scheduled commencement of any fabrication.

(b) In multiple pass welds, the weld may be deposited such that at least two layers on all surfaces and edges are deposited with one of the filler metals listed above for each particular welding process, provided the underlying layers are deposited with one of the filler metals specified in CSA Standard W59.

E17.5.4 Miscellaneous Materials

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

E17.6 Equipment

E17.6.1 General

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

E17.7 Construction Methods

E17.7.1 Bearings

(a) The Contractor shall review the approved Shop Drawings of Bid Opportunity 957-2010, Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge for the installation of pier bearings.

(b) The Manufacturer shall ship each bearing fully assembled. The bearings are not to be disassembled prior to final installation without the knowledge of the Manufacturer and the Contract Administrator.

(c) Bearings when received by the Contractor shall be unloaded and stored in accordance with the Manufacturer's recommendations.

(d) The bearing plate is to be fixed to the existing embedded base plate utilizing the existing fixing bolt locations as noted in the Drawings.

E17.7.2 Welding

(a) All welding shall conform to the requirements of CAN/CSA W59.1.

(b) 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 or pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting or pickling.

E17.7.3 Bearing Removals

(a) Prior to the commencement of jacking, the height of the supported girder is to be measured with respect to the concrete bearing surface at various locations and recorded. The entire bridge cross-section shall be raised equally at the same time to permit simultaneous replacement of the bearings on the pier or abutment.

(b) Minimum jacking shall take place during bearing removals. Unless otherwise approved by the Contract Administrator, the Bridge shall not be elevated by more than 6 mm above the height of bearing as shown on the drawings.

(c) Care should be taken to not overload adjacent bearings.

(d) Following the removal of existing bearings, new bearings shall be immediately installed.

E17.7.4 Bearing Replacement

(a) Replace all bearings, being careful not to overload adjacent bearings. Set bearings in the proper location relative to the Bridge superstructure temperature. Consult with the Contract Administrator on the location.

(b) Bearing replacement shall take place by phase bearings at each pier or abutment shall be replaced at the same time.

(c) Raise the whole bridge cross section for each phase of Work at each pier or abutment simultaneously using the jacking locations as shown on the Drawings.

E17.8 Quality Control

E17.8.1 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.

E17.8.2 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

E17.8.3 Fabrication and Installation Guarantee

(a) The Contractor will coordinate with the bearing Supplier of Bid Opportunity 957-2010, Supply, Fabrication, and Delivery of Bearings – Osborne Street Bridge for the delivery and installation of the bearings. Upon installation of the bearings the bearing Supplier shall inspect the bearings to certify that the bearings have been properly installed. The Contractor shall coordinate with the bearing Supplier and provide a written guarantee that the bearings 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 bearing installation and certification from the bearing Supplier.

E17.9 Measurement and Payment

E17.9.1 Disc Bearings

(a) Installing each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, or source of manufacture. Measurement for payment purposes shall be the total number of such units installed.

(b) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings, including jacking and shoring operations, required to complete the installation of disc bearings shall be considered incidental to “Install Disc Bearings”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

(c) Any necessary engineering and adjustment shall be considered incidental to the Work.

(d) Upon completion of disc bearing installation, the Contractor shall receive a partial payment of eighty (80%) percent. Upon completion of inspection and certification of the installed bearings, the balance of the partial payment of twenty (20%) percent will be made.

(e) Installation of disc bearings shall be paid for at the Contract Unit Price per unit for “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:

(f) Items of Work:

(i) Install Disc Bearings

(i) Mk’D’;

(ii) Mk'E';
(iii) Mk'F'; and
(iv) Mk'G'.

E17.9.2 Steel Reinforced Elastomeric Bearings

(a) Installation of each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, or source of manufacture, Measurement for payment purposes shall be the total number of such units installed.

(b) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings, including jacking and shoring operations, required to complete the installation of disc bearings shall be considered incidental to "Install Steel Reinforced Elastomeric Bearings", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

(c) Any necessary engineering and adjustment shall be considered incidental to the Work.

(d) Upon completion of steel reinforced elastomeric bearing installation, the Contractor shall receive a partial payment of eighty (80%) percent. Upon completion of inspection and certification of the installed bearings, the balance of the partial payment of twenty (20%) percent will be made.

(e) Installation of steel reinforced elastomeric bearings shall be paid for at the Contract Unit Price per unit for "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:

(f) Items of Work:

(i) Install Steel Reinforced Elastomeric Bearings
(i) Mk'A';
(ii) Mk'B'; and
(iii) Mk'C'.

E18. POST TENSIONING TENDONS INSPECTION AND REMEDIAL REPAIRS

E18.1 Description

(a) This Specification shall cover all operations relating to the inspection and repair of the post tensioning tendons in the existing bridge deck and the installation of a zinc based galvanic corrosion protection system, as herein specified.

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

E18.2 Referenced Specifications and Drawings

(a) The latest edition and all subsequent revisions of:
(i) ACI 222R – Protection of Metals in Concrete Against Corrosion;
(ii) ASTM B6 – Standard Specification for Zinc;
(iii) ASTM B69 – Standard Specification for Rolled Zinc;
(iv) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes; and
(v) SSPC-10 – Near-White Blast Cleaning.

E18.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Inspecting and assessing the condition of the post tensioning tendons in the existing Bridge deck;

(ii) Assessing the required course of action for repairs required for these post tensioning tendons;

(iii) Repairing the post tensioning tendons in the existing Bridge deck; and

(iv) Protecting all repaired post tensioning tendons, through the supply, installation, and energization of a zinc-based galvanic corrosion protection system.

E18.4 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 to the commencement of any scheduled Work on the Site, the post tensioning repair procedure.

(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.

(d) The Contractor shall submit to the Contract Administrator for review and approval the calibration certificate of the torque wrench to be used for tightening operations, upon delivery of the torque wrench to site.

E18.5 Materials

E18.5.1 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.

E18.5.2 Cable Splice

(a) The cable splice shall be GRABB-IT Cable Splice as supplied by Dywidag Systems of Surrey, B.C. or or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

(b) The GRABB-IT Cable Splice shall be zinc chromate plated in accordance with the latest edition and all subsequent revisions of ASTM B633, Type 3 to provide corrosion resistance.

E18.5.3 Replacement Strand

(a) Replacement strand shall be 270 KSI, 13 mm wire.

E18.5.4 Post Tensioning Strand Grout

(a) The post tensioning strand grout to fill voids and seal existing post tensioning strands for use within the post tensioning tendon duct located in the deck shall be an unsanded silica fume grout which lists as one of its uses, grouting of post tensioning cables. An approved product is TARGET 1118, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

E18.5.5 Standard Pre-Mixed Bagged Grout for Recess Grouting

(a) The standard pre-mixed bagged grout for recess grouting alongside the duct may be either the post tensioning cable grout, or a non-stick, cement-based grout. An approved product is SikaGrout 212, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

E18.5.6 Zinc Anodes

(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 (0.6 lb/ft) 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
www.vector-corrosion.com

or approved by the Contract Administrator in accordance with B6 “Substitutes”.

E18.6 Equipment

E18.6.1 General

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

E18.6.2 Torque Wrench

(a) The torque wrench supplied for the tightening of the cable splice units shall be recently calibrated and shall have a calibration certificate attached with its delivery to the site.

E18.7 Construction Methods

E18.7.1 General

(a) The intent of the Work is to inspect the post tensioning ducts located in the deck above the piers at the locations identified by the Contract Administrator for completeness of grout fill, and broken or corroded steel strands. If not completely filled, the unfilled length of duct in the deck is to be opened, the strands inspected and repaired as required, and the voids grouted. The Contract Administrator shall complete all inspection and assessment of the items noted above and will provide the necessary instruction for the repair work that will take place.

(b) A post tensioning cable break detection survey will take place prior to the commencement of Work on Site. The Contract Administrator shall use the results of this survey to identify locations where post tensioning repair is to take place.

(c) The final inspection and repair of the post tensioning tendons shall take place following completion of bridge deck surface preparation activities part of structural removals. The Contractor shall take care to protect the post tensioning tendons during hydrodemolition activities. Exposed conduits and tendons shall be completely dry prior to commencement of any repair works. Refer also to E8, “Structural Removals”.

(d) There are a total of 222 existing post tensioning tendons (37 over each pier) that will remain in the concrete deck following completion of structural removal operations.

(e) The galvanic corrosion protection system shall consist of 1000 mm long anodes tied continuously along both sides of the post tensioning ducts where exposed for cable repairs. The anode units are to be connected to the existing transverse reinforcing steel and exposed post tensioning tendons and ducts on each side of repaired tendon, as shown on the Drawings. A minimum of 25 mm of clear concrete shall be placed over the anode units. A maximum space of 150 mm should be allowed between ends of anodes. 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.

E18.7.2 Post Tensioning Inspection and Remedial Repairs

(a) This item of Work covers all the Work of this section except for the actual supply and installation of the replacement strand assemblies, post tensioning strand grout, recess grounting, and zinc anode.

(b) The Work may require several trips and be done over more than one day.

E18.7.3 Inspection and Repair Method

(a) It is expected that there will be thirty (30) such locations, which will be confirmed following the submission of the cable break detection report. The Contract Administrator shall designate the locations where post tensioning tendon inspection will take place. The Contract Administrator shall complete all post tensioning tendon inspections.

(b) As part of Stage III, Type 3 Deck Concrete Removals as described in E8, “Structural Removals”, remove deck slab concrete from approximately the top 1/3 of the circumference at the locations and for the length specified by the Contract Administrator and clean the pipe of all residual tape and sealants.

(c) It is important that for the duration that the ducts are exposed, they be kept dry. No water should enter the ducts.

(d) Spread open the existing duct at the top to allow for inspection of the inside for the completeness of the original grout injection. It may be necessary to cut away some of the duct to inspect the tendon and to carry out the necessary splicing and grouting.

(e) If some of the strands of the tendon are not covered in grout, clean off the strands. Inspect the strands for corrosion. Where corroded, remove the corrosion with a light grit blast. The Contract Administrator will decide which and how many of the strands may need to have new sections spliced into them.

(f) Depending on the extent of damage to the strands of the tendon, further localized concrete removals may be required to complete post tensioning repair. This shall be directed by the Contract Administrator.

(g) Engage a specialist in post tensioning repair to carry out the strand splicing. One such approved specialist is:

GMD Consulting
P.O. Box 142, R.R. 2
Lorette, Manitoba, R0A 0Y0
Phone: (204) 784-2145
Contact: Gerry deRocquigny

(h) The Grabb-IT splice shall be installed in the existing concrete deck to allow for minimum of 25 mm concrete cover from the top of the new deck slab concrete. Further localized Stage III Type 3 Removals, as identified in E8 “Structural Removals” may be required, depending on the location of the post tensioning strand to be replaced.

(i) The repaired strands are to be tensioned to 60% of their ultimate capacity with a recently calibrated torque wrench.

(j) Galvanic corrosion protection installation shall be completed as detailed below in E18.7.4 “Galvanic Corrosion Protection”.

(k) Cover all strands and splices that may have been installed and uncovered strands in the deck with post tensioning cable grout.

(l) Using a standard premixed bagged grout, fill the recess along the edges of the pipe to keep water from ponding in the recess.

E18.7.4 Galvanic Corrosion Protection

(a) 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.

(b) 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.

(c) Surface Preparation

(i) All spalled and delaminated concrete should be repaired using compatible repair materials in accordance with E8 “Structural Removals” and E15 “Repair of Miscellaneous Concrete” as shown on the Drawings.

(d) 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.

(e) 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.

(f) 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.

(g) Concrete Placement

(i) Complete consolidation of grout between the anode and surrounding concrete should be maintained to ensure optimal anode performance.

E18.8 Quality Control

E18.8.1 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.

E18.8.2 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.

E18.9 Measurement and Payment

E18.9.1 Post Tensioning Inspection and Remedial Repairs

(a) Inspecting and completing the remedial repairs outlined in E18.7.2 shall be paid for at the Contract Unit Price per lineal metre for “Post Tensioning Inspection and Remedial Repairs”, 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.

E18.9.2 Post Tensioning Strand Splicing

(a) Strand splicing shall be paid for at the Contract Unit Price per unit for the "Supply and Install Post Tensioning Strand Splicing", 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.

E18.9.3 Post Tensioning Cable Grout

(a) Supplying and installing post tensioning cable grout shall be paid for at the Contract Unit Price per lineal metre for "Supply and Install Post Tensioning Cable Grout”, 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. No payment will be made for grout that is not installed or grout that is wasted.

E18.9.4 Zinc Anode Units

(a) Zinc anode units shall be paid for at the Contract Unit Price per unit for “Supply and Install Zinc Anode Units”, performed in accordance with this Specification 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.

E18.9.5 Recess Grouting

(a) Supplying and installing recess grouting shall be paid for at the Contract Unit Price per lineal metre for "Supply and Install Recess Grouting", 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.

E19. EXPANSION JOINTS

E19.1 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.

E19.2 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.

E19.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the expansion joints;

(ii) Casting concrete for the expansion joint dams;

(iii) Supplying and installing the expansion joint seals;

(iv) Completing a watertight verification of the expansion joint seals;

(v) Supply and installing the expansion joint cover plates and other miscellaneous steel items; and

(vi) Seal welding the flange of the expansion joint edge members to the corner plates.

E19.4 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.

E19.5 Materials

E19.5.1 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.

E19.5.2 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.

E19.5.3 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 an equivalent to Wabo Modular Joint System "D" series "box" seals, as specified in the Drawings, and supplied by D.S. Brown, Goodco, or Watson Bowman Acme Corp., or equal as accepted by the Contract Administrator, in accordance with B6, "Substitutes".

(c) Modular 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.

E19.5.4 Strip Seal Expansion Joints

(a) Expansion joints shall be a strip seal type where and as shown on the Drawings.

(b) The strip seal expansion joints shall be an equivalent to Wabo Modular Joint System "Strip Seal" series system, "M" series, as specified in the Drawings, and supplied by D.S. Brown, Goodco, or Watson Bowman Acme Corp., or equal as accepted by the Contract Administrator, in accordance with B6, "Substitutes".

(c) Strip seal 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.

E19.5.5 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 B6, "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.

E19.5.6 Steel Extrusions

(a) Steel for the extrusions shall conform to the requirements of CAN/CSA G40.21, Grade 230G minimum.

E19.5.7 Anchor Studs

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

E19.5.8 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 an approved non-slip grit paint.

E19.5.9 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.

E19.5.10 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.

E19.5.11 Preformed Neoprene Joint Seals

(a) Further to E19.5.3(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 E19.1 of this Specification. All tests will be made on specimens prepared from the extruded seals.

E19.5.12 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 B6, Substitutes".

E19.5.13 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 B6, "Substitutes".

E19.5.14 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 B6, "Substitutes". The minimum compressive strength of the grout at 28 days shall be 40 MPa

E19.6 Equipment

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

E19.7 Construction Methods

E19.7.1 Fabrication

(a) No fabrication shall commence until acceptance of the Shop Drawings from the Contract Administrator has been obtained.

(b) 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.

(c) Matching expansion joint assemblies shall be assembled and bolted together for shipping.

(d) Expansion joint assemblies shall be shop checked for fit and match marked.

(e) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint, and other foreign material by commercial sand, grit or shop blasting, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.

(f) In no case shall weldments be substituted for extrusion shapes.

E19.7.2 Installation

(a) Expansion joints shall be installed in two construction phases. A field splice will be required as shown on the Drawings to join the expansion joints together for the Northbound and Southbound Bridges, which shall take place during Phase 2 Construction in 2012.

(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.

E19.7.3 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.

E19.7.4 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

E19.7.5 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.

E19.7.6 Installation of Seal

(a) A temporary expansion joint seal at each expansion joint unit will be required for the roadway completed as part of Phase 1 Construction Works in 2011. This seal will be replaced with a permanent seal at each unit as part of Phase 2 Construction in 2012.

(b) A permanent seal at each expansion joint unit shall be installed as one continuous piece after completion of all concreting operations, as part of Phase 2 Construction Works in 2012, to the satisfaction of the Contract Administrator.

(c) 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.

(d) The installation of the expansion joint seal will be completed in two phases. A temporary seal will be installed for Phase 1 Construction. Following the installation of the expansion joint as part of Phase 2 Construction, one continuous seal will be installed.

E19.7.7 Watertight Verification of Joint Seal

(a) Prior to installing the expansion joint and sidewalk 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. 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.

E19.7.8 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 E19.7.5, “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.

E19.8 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 foud 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.

E19.9 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 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.

E19.10 Quality Control

E19.10.1 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.

E19.10.2 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.

E19.10.3 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.

E19.10.4 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 E20.1, “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 E19.1: 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
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

E19.11 Measurement and Payment

E19.11.1 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.

E20. ALUMINUM PEDESTRIAN HANDRAIL, ART BALUSTERS, AND ART GATEWAY PANELS

E20.1 Description

(a) This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail, art balusters, and art gateway panels as specified herein and as shown on the Drawings.

(b) This Work shall be completed in coordinating all operations with E14 “Sidewalk Wearing Surface Concrete (WSC) Overlay” and E22 “LED Lighting for Aluminum Pedestrian Handrails, Art Balusters, and Art Gateway Panels”.

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

E20.2 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.

E20.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the aluminum pedestrian handrail;

(ii) Supplying and installing landmark art balusters along the length of the aluminum pedestrian handrail and coordinating all operations for the installation of the sidewalk WSC overlay;

(iii) Supplying and installing art gateway panels along the length of the aluminum pedestrian handrail; and

(iv) Supplying and installing miscellaneous steel items and other items associated with the Work.

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 scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail, art balusters, and gateway panels. 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 E20.7.5, “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

E20.5 Materials

E20.5.1 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.

E20.5.2 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.

E20.5.3 Material for the Aluminum Pedestrian Handrail, Art Gateway Panels and Art Balusters

(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) Aluminum plates for the art balusters and gateways shall conform to the requirements of the latest edition and all subsequent revsions of ASTM B221 Alloy 5083.

(d) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

E20.5.4 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.

E20.5.5 Handrail Anchorage System

(a) The handrail anchorage system is specified and paid for in accordance with E12, “Structural Concrete”.

E20.5.6 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.

E20.5.7 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.

E20.5.8 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 B6 “Substitutes”.

E20.6 Equipment

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

E20.7 Construction Methods

E20.7.1 Layout

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

E20.7.2 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 and one art baluster that is completely wired and operational to the Contract Administrator and receive acceptance of the sample panel from the Contract Administrator 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.

(ii) The Contractor shall be required to supply one fabricated and laser cut aluminum art baluster to the Contract Administrator and receive acceptance of the sample baluster prior to proceeding with fabrication of the remainder. The sample, once accepted, shall be identifiable for the duration of the Project, but may be incorporated in with the other balusters. It shall become standard for acceptance of all aluminum art balusters.

(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.

E20.7.3 Aluminum Art Balusters and Gateways

(a) The aluminum art balusters and gateways shall be fabricated as shown on the Drawings.

The wording of the aluminum art balusters shall be laser cut. Wording shall be provided following award of Contract when finalized. For sample baluster wording refer to Drawings.

E20.7.4 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.

E20.7.5 Installation of Aluminum Art Balusters and Art Gateway Panels

(a) The aluminum art balusters shall be accurately installed as shown on the Drawings. Coordination will be required with the layout of stainless steel sidewalk art pieces in the WSC overlay to ensure that balusters are located at the correct position.

(b) The aluminum art gateway panels shall be brought on-site and accurately installed as shown on the Drawings.

(c) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator.

E20.8 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.

E20.8.2 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.

E20.8.3 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.

E20.9 Measurement and Payment

E20.9.1 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.

E20.9.2 Aluminum Art Gateway Panels

(a) Supplying and Installing the aluminum art gateway panels shall be paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Art Gateway Panels", 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.

E20.9.3 Aluminum Art Balusters

(a) Supplying and Installing the aluminum art gateway panels shall be paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Art Balusters", 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.

E21. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

E21.1 Description

(a) This Specification shall cover the application of rubberized asphalt waterproofing on the north abutment slab, 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.

E21.2 Scope of Work

(a) The Work under this Specification shall involve supplying and applying the hot-poured rubberized asphalt waterproofing system on the north abutment slab.

E21.3 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.

E21.4 Materials

E21.4.1 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.

E21.4.2 Rubberized Asphalt Waterproofing

(a) Rubberized asphalt waterproofing shall be American Hydrotech's Monolithic Membrane 6125, BAKOR 790-11 Hot Applied Rubberized Asphalt Waterproofing/Roofing Membrane, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

E21.4.3 Elastomeric Sheet Membrane

(a) The elastomeric sheet membrane shall be a heavy duty sheet. An approved product is Elaso-Petrotech No. 240 or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.and is to be compatible with the hot-poured rubberized asphalt waterproofing.

E21.4.4 Cement

(a) Cement shall be normal Portland Cement.

E21.4.5 Surface Conditioner

(a) Surface conditioner, to be applied to the concrete surfaces of the abutment roof slabs, shall conform to the requirements of the Manufacturer of the rubberized asphalt waterproofing.

E21.4.6 Melting On-Site

(a) Cakes of rubberized asphalt waterproofing shall be melted in an approved double shell melter under continuous agitation until the material can be drawn free flowing and lump free from the melter.

(b) The temperature of the rubberized asphalt waterproofing shall not exceed 218°C at any time during the entire melting procedure.

E21.5 Equipment

E21.5.1 General

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

E21.6 Construction Methods

E21.6.1 Application

(a) The concrete surfaces onto which the hot-poured rubberized asphalt waterproofing to be applied shall be thoroughly cleaned. All rough spots, ridges, and edges in the concrete surface resulting from protrusions of concrete aggregate or cement paste shall be removed by methods approved by the Contract Administrator. A final cleaning of the concrete surfaces shall be done using high velocity compressed air. The concrete surfaces shall be dry, clean, and free from frost, dust, dirt, and all foreign matter.

(b) After the north abutment slab has been cleaned, it shall be covered with surface conditioner. The quantity used shall be 160 mL/m^2, or as recommended by the Manufacturer. The surface conditioner shall be allowed to dry before the application of the rubberized asphalt waterproofing.

(c) The rubberized asphalt waterproofing shall be brought to a temperature of between 190°C and 218°C, and then applied to the north abutment slab.

(d) The application of the rubberized asphalt waterproofing shall be carried out under the supervision of experienced personnel.

(e) The in-place thickness of the rubberized asphalt waterproofing shall not be less than 3 mm no more than 5 mm.

(f) The Contractor shall supply and install an elastomeric sheet membrane which is compatible with the hot-poured rubberized asphalt waterproofing material. The elastomeric sheet membrane shall be installed at the north abutment slab. Installation of the heavy-duty elastomeric sheet membrane shall be in accordance with the Manufacturer's recommendations.

(g) The finished elastomeric sheet membrane top surface shall be lightly dusted with Normal Portland Cement. The quantity used shall be one bag of cement per 45 m^2.

E21.7 Quality Control

E21.7.1 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.

E21.7.2 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.

E21.8 Measurement and Payment

(a) Hot-poured rubberized asphalt waterproofing shall be paid for at the Contract Unit Price per square metre for "Hot-Poured Rubberized Asphalt Waterproofing,", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The area to be paid for shall be the waterproofed surface area as shown on the Drawings and herein specified.

E22. SLOPE PAVING PROTECTION

E22.1 Description

(a) This Specification shall cover all operations related to slope paving protection Work as herein specified 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.

E22.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards

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

(ii) CW 3310 - Portland Cement Concrete Pavement Works; and

(iii) CW 3615 – Riprap.

E22.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Removing the existing concrete slope paving at the north abutment to the limits as shown on the Drawings;

(ii) Removing existing concrete slope protection between the south abutment and Pier No. 3;

(iii) Removing existing granular fill beneath the existing concrete slope protection and slope paving to the limits as shown on the Drawings;

(iv) Supplying and placing new granular backfill;

(v) Replacing the concrete slope paving at the north abutment as shown on the Drawings;

(vi) Supplying and placing geotextile material; and

(vii) Supplying and placing grouted angular rocks as a protective covering for the new slope paving protection.

E22.4 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.

E22.5 Materials

E22.5.1 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.

E22.5.2 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.

E22.5.3 Rock Material

(a) The rock supplied shall be hard, durable and angular in shape, resistant to weathering and water action, free from overburden, spoil, shale or shale seams and organic material, and shall meet the gradation requirements for the class specified. In general, no sandstone will be permitted for all classes, however if the proposed material meets or exceeds the minimum requirements, consideration may be given to accepting the material. For these occurrences, further testing shall be done to ensure acceptability. This would include testing of the material in accordance with CSA A23.2-15A “Petrographic Examination of Aggregates”. The minimum dimension of any single rock shall be not less than one third of its maximum dimension. The minimum acceptable unit weight of the rock is 2.5 t/m^3.

(b) The Contractor shall provide the Contractor Administrator with evidence of the acceptability of the riprap material. Reliable performance records of proposed material, other than fieldstone, will be considered evidence of acceptability. Fieldstone shall be considered to have a reliable performance record, and will be accepted if it meets the gradation requirements.

(c) Rock supplied for riprap shall be Class 800.

(d) Sampling and testing are required for Class 500 and Class 800 rock riprap for which no performance records are available. Sampling and testing are not required for Class

175 and Class 300 rock riprap and field stone. Tests are based on the Durability Index and Durability Absorption Ratio as developed by the State of California, Department of Transportation. The Contractor shall submit samples of the proposed material to an independent certified testing laboratory of his choice and provide written reports of the test results to the Consultant. The reports shall be stamped by a Professional Engineer. The Contractor shall be responsible for all associated costs for rock riprap sample testing including, but not limited to, transporting samples to an independent certified testing laboratory, testing, disposing of samples after testing, and providing written reports to the Contract Administrator.

(e) A representative sample of 70 kg minimum is required for each type and source of rock to be tested, and shall contain a number of pieces ranging up to 25 kg mass.

(f) The acceptance of rock samples from a particular source or quarry site shall not necessarily be construed as constituting acceptance of all material from that location.

E22.5.4 Stone Riprap Gradation

(a) The material provided for each class specified shall have a gradation that conforms to the requirements of Table E22.1, "Rock Riprap Gradation". Percentages quoted are by mass. Sizes quoted are equivalent spherical diameters, and are for guidance only.

TABLE E22.1
ROCK RIPRAP GRADATION

		CLASS			
		175	**300**	**500**	**800**
Nominal Mass (kg)		**7**	**40**	**200**	**700**
Nominal Diameter (mm)		**175**	**300**	**500**	**800**
None greater than:	Kg or mm	40 300	130 450	700 800	1800 1100
20% to 50%	Kg or mm	10 200	70 350	300 600	1100 900
50% to 80%	Kg or mm	7 175	40 300	200 500	700 800
100% greater than	Kg or mm	3 125	10 200	40 300	200 500

E22.5.5 Geotextile Fabric

(a) Where geotextile fabric is specified, the slope shall be graded to provide a smooth, uniform surface. All stumps, large rock, brush or other debris that could damage the fabric shall be removed. All holes and depressions shall be filled so that the fabric does not bridge them. Loose or unstable soils shall be replaced.

(b) Non-woven geotextile filter fabric shall be used under all riprap in accordance with the following table of minimum average roll value properties (MARV's) for each specific Class of riprap as noted below in Table E22.2. The non-woven geotextile fabric shall meet the specifications and physical properties as listed below.

TABLE E22.2 Non-Woven Geotextile Fabric Specifications and Physical Properties		
	Class 175, 300 and 500	**Class 800**
Grab Strength	650 N	875 N
Elongation (Failure)	50%	50%
Puncture Strength	275N	550 N
Burst Strength	2.1 MPa	2.7 MPa
Trapezoidal Tear	250 N	350 N

E22.5.6 Grout

(a) Concrete grout shall be 15 MPa compressive strength at 28 days, with sand aggregate of a consistency to ensure total penetration to fill all voids in the riprap.

E22.6 Equipment

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

E22.7 Construction Methods

E22.7.1 Remove Existing Slope Paving Concrete

(a) Remove existing concrete slope paving and granular backfill as shown on the Drawings.

E22.7.2 Reinforced Concrete Slope Paving

(a) Install new reinforced concrete slope paving at the north abutment as shown on the Drawings.

(b) Reinforced concrete slope paving shall be supplied, installed, and paid in accordance with E12 “Structural Concrete”.

E22.7.3 Granular Backfill

(a) Place granular backfill in the locations shown on the Drawings.

(b) Granular backfill will be supplied, installed, measured, and paid for in accordance with CW 3110 and E10, “Structural Backfill”.

E22.7.4 Remove Existing Concrete Slope Protection

(a) Remove the existing concrete slope protection between the south abutment and Pier No. 3 to the limits as shown in the Drawings.

(b) Remove the existing granular compacted backfill to the limits shown on the Drawings.

(c) The new area of slope protection shall not exceed the dimensions shown on the Drawings or as established by the Contract Administrator in the field.

E22.7.5 Place Geotextile Fabric

(a) The fabric shall be laid parallel to the slope direction. It shall be placed in a loose fashion, however folds and wrinkles shall be avoided. Adjacent strips of fabric shall be overlapped a minimum of 300 mm. Overlaps shall be pinned using 6 mm diameter steel pins fitted with washers and spaced at 1 m intervals along the overlaps.

(b) The top edge of the filter fabric shall be anchored by digging a 300 mm deep trench, inserting the top edge of the fabric and backfilling with compacted soil. Care shall be

taken to prevent puncturing or tearing the geotextile. Any damage shall be repaired by use of patches that extend at least 1 m beyond the perimeter of the tear or puncture. Care shall be taken to ensure that the geotextile is in intimate contact with the subgrade and that there are no void spaces between the subgrade and the geotextile.

(c) The fabric shall be covered by rock riprap within sufficient time so that ultraviolet damage does not occur; in no case shall this time exceed seven (7) days for ultraviolet material and fourteen (14) days for ultraviolet protected and low ultraviolet susceptible polymer geotextiles.

(d) Riprap placement shall commence at the base of the blanket area and proceed up the slope. The height of drop of riprap shall be limited to 1.0 m or less, and the riprap shall not be allowed to roll down the slope. Heavy equipment will not be permitted to operate directly on the geotextile.

E22.7.6 Place Rock Riprap

(a) The rock shall be handled, dumped or placed into position to conform to the specified gradation and to the cross section shown on the Drawings. The finished surface shall be reasonably uniform, free from bumps or depressions, and with no excessively large cavities below or individual stones projecting above the general surface.

(b) Control of gradation will be by visual inspection.

E22.7.7 Place Grout

(a) Placing of concrete sand grout shall be as per Clause 9.3 of CW 3615. The total depth of grout and riprap shall be 900 mm.

(b) Notwithstanding and in addition to requirements of CW 3615, the following procedure shall apply:

(i) Thoroughly moisten the rocks and wash any excess fines to the underside of the riprap;

(ii) Place mortar only when the temperature is above 2 °C and rising;

(iii) Place the mortar in a manner to prevent segregation;

(iv) Fill all voids without unseating the rocks;

(v) Provide weep holes through the riprap;

(vi) Protect the mortared riprap from freezing and keep it moist for 3 days after the work is completed; and

(vii) Place the riprap in lifts of 300 mm or less. Grout each lift prior to placing the next lift. Construct and grout the succeeding lifts before the grout in the previous lift has hardened.

E22.8 Quality Control

E22.8.1 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.

E22.8.2 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.

E22.9 Measurement and Payment

E22.9.1 Remove Existing Slope Paving

(a) Removing the existing concrete slope paving and sidewalk will not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Remove Existing Slope Paving", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E22.9.2 Construct Slope Protection

(a) The quantity of grouted heavy rock riprap to be paid for will be measured in place in cubic meters. The volume of rock paid for will be calculated from the thickness of the riprap as shown on the Drawings, and the actual area covered. Overages in thickness or area beyond the limits shown on the drawings will not be paid for unless these changes were requested by the Contract Administrator.

(b) Constructing the new grouted rock riprap for the slope protection at the south abutment will be paid for at the Contract Unit Price per cubic metre for "Construct Slope Protection", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for the removal of the existing concrete slope protection and granular fill, shaping the new riprap bed, supplying and installing all geotextile fabric, loading, hauling, and placing riprap, placing of concrete grout, and for performing all operations herein described and all other items incidental to the Work.

E23. LED LIGHTING FOR ALUMINUM PEDESTRIAN HANDRAILS, ART BALUSTERS, AND ART GATEWAY PANELS

E23.1 Description

(a) This Specification covers the supply and installation of LED lighting system to designed railing supports and art panels as indicated on the Drawings and as herein specified.

(b) Coordinate exact locations and product specific installation requirements with associated trades and consultants.

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

E23.2 Referenced Specifications and Drawings

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

(i) ANSI/IEEE 142 – Recommended Practice for Grounding of Industrial and Commercial Power Systems;

(ii) ASTM D1187 Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings for Metal;

(iii) CAN/CSA C22.1 – Canadian Electrical Code Part 1;

(iv) CAN/CSA C22.2 – Information Technology Equipment - Safety - Part 1: General Requirements; and

(v) CAN/CSA C22.3 – Electrical Conduit.

E23.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing Illuminated railing support bars that will emulate and match the stainless steel art sidewalk strip patterns in the sidewalk WSC overlay along both the east and west sides of the Bridge;

(ii) Supplying and installing Illuminated art gateway panels at either end of the aluminum pedestrian handrails on both the east and west sides of the Bridge; and

(iii) Completing all installation efforts in coordination with the construction of the sidewalk WSC overlay and the aluminum art balusters and art gateway panels along the length of the aluminum pedestrian handrails.

E23.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days to the commencement of any fabrication, the proposed shop drawings and a coordination layout drawing complete with dimensions showing the sidewalk WSC strip coordination.

E23.5 Materials

E23.5.1 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) Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.

E23.5.2 Electrical Wire And Box Connectors (0-1000 V)

(a) Pressure type wire connectors to the latest edition and all subsequent revisions of: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

(b) Fixture type splicing connectors to the latest edition and all subsequent revisions of: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

(c) Bushing stud connectors: to NEMA to consist of:

(i) Connector body and stud clamp for copper conductors.

(ii) Clamp for copper conductors.

E23.5.3 Electrical Wires And Cables (0-1000 V)

(a) Teck Cable

(i) Cable: Meeting the requirements of CAN/CSA C22.2 No. 131.

(ii) Conductors:

- Grounding conductor: copper.
- Circuit conductors: copper size as indicated.

(iii) Insulation:

- Chemically cross linked thermosetting polyethylene rated type RW90, 600 V.
- Inner jacket: polyvinyl chloride material.
- Armour: interlocking, aluminum.
- Overall covering: polyvinyl chloride material.

(iv) Fastenings:

- One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- Channel type supports for two or more cables at 600 mm centers.
- Threaded rods: 6 mm dia. to support suspended channels.

(v) Connectors:

- Approved for TECK cable, waterproof.

E23.5.4 Electrical Grounding

(a) General

(i) Bond all non-current carrying metal to the existing bridge grounding system. Ensure ground conductors are suitably sized to carry maximum fault currents. Avoid ground loops.

(b) Equipment

(i) Clamps for grounding of conductor: size as required .

(ii) Grounding conductors: bare stranded copper, , soft annealed, size as indicated.

(iii) Non corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- Grounding and bonding bushings.
- Protective type clamps.
- Bolted type conductor connectors.
- Thermit welded type conductor connectors.
- Bonding jumpers, straps.
- Pressure wire connectors.

E23.5.5 Electrical Hangars and Supports

(a) Support Channels

(i) Galvanized U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended, set in poured concrete walls and ceilings.

E23.5.6 Electrical Junction and Pull Boxes

(a) Junction And Pull Boxes

(i) PVC or cast construction with screw on flat covers for surface mounting.

(ii) IP68 or NEMA 3R rated.

(iii) 100 mm square or larger outlet boxes as required for special devices.

(iv) Size boxes in accordance with CAN/CSA C22.1.

(v) Provide cover plates for boxes.

(b) Fittings General

(i) Bushing and connectors with nylon insulated throats.

(ii) Knock out fillers to prevent entry of debris.

(iii) Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

(iv) Double locknuts and insulated bushings on junction boxes.

E23.5.7 Electrical Conduits, Conduit Fastenings and Conduit Fittings

(a) Conduits

(i) Rigid PVC conduit shall conform to the requirements of CAN/CSA C22.2 No. 211.2.

(ii) Flexible metal conduit shall conform to the requirements of CAN/CSA C22.2 No. 56, aluminum metal.

(iii) RGS conduit embedded in concrete shall be epoxy coated.

(b) Conduit Fastenings

(i) One hole malleable iron steel straps to secure surface conduits NPS 2 50 mm and smaller. Two hole steel straps for conduits larger than NPS 2 50 mm.

(ii) Beam clamps to secure conduits to exposed steel beams.

(c) Conduit Fittings

(i) Fittings: manufactured for use with conduit specified. Coating: same as conduit.

(ii) 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.

(d) Bituminous Paint

(i) Bituminous paint shall be alkali – resistant coating and conform to the requirements of ASTM D1187. Supply of bituminous paint shall be incidental to the supply of electrical conduits.

E23.5.8 Light Fixtures:

(a) LED Lamp

(i) Aluminum Enclosure

(ii) Lens Cap

(iii) 5.5 W at 12 VDC for each Light Fixture (2.2 w/ft x 2 ft – 6 in. long = 5.5 s/fixture)

(iv) 150 W at 12 VDC/120VAC Power Supply for Twenty Five (25) Hand Rail Light Fixtures

(b) Electrical Junction Box at end of Light Fixture in hand rail

(i) CSA Approved

(ii) IP68 or NEMA 3R rated.

(c) Acceptable Manufacture: MMJ Lighting Model D500 LED.Fix.2.2 WP C/W D121C Lens and D121-3 Extrusion

E23.5.9 Control Panels:

(a) Enclosures to be NEMA 3R or IP68 Lockable with a hinge door

(b) 150W – 12 VDC/120 VAC power supplies for hand rail light fixtures (1 Power Supply for a maximum of twenty five fixtures each)

(c) 20A, 1 pole, 120 VAC panel back plate mounted circuit breaker for power supplies

(d) 30 AMP, non-fused disconnect switch mounted on panel faceplate

(e) Terminal blocks mounted on panel plate as required

(f) CSA Approved and labeled

(g) An approved Manufacturer is MMJ Lighting, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

E23.5.10 Wiring Terminations

(a) Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

E23.6 Equipment

E23.6.1 General

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

E23.6.2 Care, Operation and Start-up

(a) Instruct user's operating and maintenance personnel in the operation, care and maintenance of systems, system equipment and components.

E23.7 Fabrication

E23.7.1 General

(a) Factory assemble control panels and component assemblies.

E23.7.2 Manufacturers and CSA Labels

(a) Visible and legible, after equipment is installed.

E23.7.3 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 exposed non galvanized hangers, racks and fastenings to prevent rusting to the satisfaction of the Contract Administrator

E23.7.4 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.

E23.8 Construction Methods

E23.8.1 Codes and Standards

(a) Complete installation in accordance to the latest edition and all subsequent revisions of CAN/CSA C22.1. and all Manitoba and Winnipeg codes and bylaws.

E23.8.2 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 Contract Administrator 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.

E23.8.3 Electrical Grounding

(a) General Installation

(i) Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

(ii) Protect exposed grounding conductors from mechanical injury.

(iii) Use mechanical connectors for grounding connections to equipment provided with lugs.

(iv) Soldered joints not permitted.

(v) Install separate ground conductor to outdoor lighting standards.

(vi) Connect Bridge structural steel to ground by welding copper to steel.

(b) Equipment Grounding

(i) Bond all non current carrying metal to Bridge ground conductors..

(c) Field Quality Control

(i) Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

(ii) Perform tests before energizing electrical system.

E23.8.4 Electrical Hangars and Supports

(a) Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

(b) Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

(c) Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

E23.8.5 Electrical – Junction and Pull Boxes

(a) Junction, Pull Boxes And Cabinets Installation

(i) Install pull boxes in inconspicuous but accessible locations.

(ii) Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run or a mximum of 180 degrees of conduit bends between pull boxes.

E23.8.6 Electrical Outlet Boxes, Conduit Boxes and Fittings

(a) Support boxes independently of connecting conduits.

(b) Fill boxes with rags, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

E23.8.7 Electrical Conduits, Conduit Fastenings and Conduit Fittings

(a) Surface Conduits

(i) Run parallel or perpendicular to Bridge lines.

(ii) Run conduits in flanged portion of structural steel.

(iii) Group conduits wherever possible on suspended surface channels.

(iv) Do not pass conduits through structural members except as indicated.

(b) Conduits In Cast-in-Place Concrete

(i) Locate to suit reinforcing steel. Install in centre one third of slab.

(ii) Protect conduits from damage where they stub out of concrete.

(iii) Install sleeves where conduits pass through slab or wall.

(iv) Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

(v) All flexible metal conduit to be cast against concrete shall be epoxy coated..

(vi) Do not place conduits is slabs in which slab thickness is less than four (4) times conduit diameter, wherever possible.

(vii) Encase conduits completely in concrete with minimum 25 mm concrete cover.

(viii) Organize conduits in slab to minimize cross overs.

(ix) Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic sized for free passage of conduit, and protruding 50 mm.

(x) If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

E23.8.8 Electrical Wires And Cables (0-1000 V)

(a) Installation of Teck Cable (0- 1000 V)

(i) Group cables wherever possible on channels.

E23.9 Quality Control

E23.9.1 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.

E23.9.2 Access

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

E23.9.3 Conduit And Cable Installation

E23.9.4 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) Insulation resistance testing.

(i) Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

(ii) Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

(iii) Check resistance to ground before energizing.

(c) Submit test results for Engineer's review.

E23.10 Measurement and Payment

E23.10.1 Lighting for Aluminum Pedestrian Handrail, Art Balusters, and Art Gateway Panels

(a) The partial supply of electrical conduits and their appurtenances and full installation will not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “LED Lighting For Aluminum Pedestrian Handrails, Art Balusters, and Art Gateway Panels” 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 an all other items incidental to the Work.

E24. BRIDGE STREET LIGHTS, NAVIGATION LIGHTS, RIVER LEVEL MONITORING SYSTEM, AND UNDERBRIDGE LIGHT FIXTURES

E24.1 Description

(a) This Specification shall cover the supply and installation of new Bridge street light conduits, the supply and installation of new navigation lights the supply and installation of the conduits for the River Level Monitoring System, and the replacement of underbridge light fixtures and miscellaneous electrical Work at the north abutment.

(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 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.

E24.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing all conduits complete with pull wire, lighting fixtures, circuit breakers, photocells, pull boxes, junction boxes, couplings, wiring, and all required appurtences and incidental components to allow for provision of a complete and operational lighting system;

(ii) Supplying and installing new navigation lights;

(iii) Replacing the fixtures for the underbridge lights as shown on the Drawings;

(iv) Supplying and installing new underbridge lights, as shown on the Drawings, and installing a photocell to control the new underbridge lighting;

(v) Supplying and installing miscellaneous electrical items in the north abutment.

E24.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the 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.

E24.5 Materials

E24.5.1 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.

E24.5.2 Conduit Materials Supplied by the Contractor

(a) The Contractor shall supply all components necessary for a proper installation except for those items identified above as supplied by the Utilities.

(b) The Contractor shall supply the 50 mm conduit for the street lighting and 25 mm conduit for the navigation lights, and the underbridge pedestrian lights. All conduits, pull boxes, and junction boxes for the River Level Monitoring System, and lighting embedded work shall be Rigid PVC conforming to the requirements of CAN/CSA C22.2 No 136. All covers for boxes shall be stainless steel with stainless steel screws. Flexible couplings shall be such as Crouse hinds Type EC or equal as accepted by the Contract Administrator.

(c) The Contractor shall also supply the conduit support/anchoring systems and conduit expansion/contraction joints.

E24.5.3 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.

(c) Photocells to control underbridge lighting shall be 15A-1P, wall-mounted, weather-proofed, and encased in vandal-resistant cover.

E24.5.4 Conductors

(a) Conductors shall be stranded.. Minimum size shall be 12 AWG.

E24.5.5 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.

E24.5.6 Light Fixtures for Navigation Lighting

(a) Lighting fixtures shall be Crouse-Hinds Model VDA-22 (Pendant Type), 150-watt, complete with clear globe (G23), guard (P20), and long-life bulbs. The bulbs shall be 28 watt compact fluorescent lamps or equal as approved by the Contract Administrator. Ensure the lamps are compatible with the fixture..

E24.5.7 River Level Monitoring System

(a) The river level monitoring meter shall be supplied by the City.

E24.5.8 Cable for the River Level Monitoring System

(a) Cable for the River Level Monitoring System shall be supplied by the City.

E24.5.9 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.

E24.5.10 Wiring Terminations

(a) Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

E24.5.11 Bridge Street Lighting

(a) As noted in E12.7.6 “Anchor Units for Bridge Street Lighting and Aluminum Pedestrian Handrail”, the Contractor shall be responsible for supplying and installing the conduit and the anchors for the Bridge street lighting. The Bridge street lighting conductor and poles shall be supplied and installed by Manitoba Hydro. The Contractor shall coordinate the work of Manitoba Hydro with his and ensure that Hydro has enough time to complete their works before the opening of the bridge to the public.

E24.6 Equipment

E24.6.1 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.

E24.6.2 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.

E24.7 Fabrication

E24.7.1 General

(a) Factory assemble control panels and component assemblies.

E24.7.2 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.

E24.7.3 Manufacturers and CSA Labels

(a) Visible and legible, after equipment is installed.

E24.7.4 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.

E24.7.5 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.

E24.7.6 River Level Monitoring System

(a) The Contractor shall provide and install as shown on the Drawings. The installation of the River Level Monitoring System and associated connection shall be done by others.

E24.8 Construction Methods

E24.8.1 General

(a) The Contractor will be responsible to supply and install the electrical cable conductors for the navigation lights from the Bridge street lighting, as shown on the Drawings. The connection at the Bridge street lighting will be made by Manitoba Hydro.

(b) The Contractor will be responsible to supply and install the electrical cable conductor for the pedestrian light fixtures from the nearest bridge lighting pole, as shown on the Drawings. The connection at the bridge lighting pole will be made by Manitoba Hydro.

E24.8.2 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.

E24.8.3 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.

E24.8.4 Bridge Street Lighting

(a) Roadway luminaires located on the Bridge deck shall be supplied, erected, wired, and connected by Manitoba Hydro. The Contractor shall provide and install luminaire bases and conduit system associated with these luminaires, including conduits complete with pull wires and the necessary pull boxes, junction boxes, expansion fittings, and all required accessories. The Contractor shall schedule and coordinate all such work with Manitoba Hydro.

(b) As described elsewhere in this Specification, the Contractor will be responsible to supply and install the conduit and the anchors for the Bridge street lighting. The roadway lighting conductor and poles will be supplied and installed by Manitoba Hydro. The Contractor shall coordinate the Work of Manitoba Hydro with his and ensure that Hydro has enough time to complete their works before the opening of the bridge to the public.

(c) The Contractor shall provide a minimum fifteen (15) Business Days notice for Manitoba Hydro for any installation of Bridge Street Light Lighting.

E24.8.5 Navigation Lighting

(a) Navigation lights shall be installed at the locations shown on the Drawings. It shall be the responsibility of the Contractor to ensure that the navigation lights are functional following their installation and connection to the power source (street lighting system).

(b) All structural components of the navigation lights, including the deck plate, frame c/w studs, and the rigid steel conduits shall be shop fabricated and assembled. All structural steel including rigid conduit shall be hot-dip galvanized prior to the installation at the bridge site.

E24.8.6 Underbridge Lighting

(a) The existing underbridge light fixtures located at Piers No. 1 and No. 3 are to be replaced as shown on the Drawings.

(b) Supply and install new underbridge lights at Pier No. 1 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.

E24.8.7 River Level Monitoring System

(a) The City shall supply the river level monitoring meter and cables. All other items required for the installation of the River Level Monitoring System shall be provided by the Contractor.

(b) The River Level Monitoring System shall be installed at the location shown on the Drawings. It shall be the responsibility of the Contractor to ensure that River Level Monitoring Systems is functional following reconnection to the power source.

(c) Following completion of installation, the Contract shall remove the existing system as described and paid for in E8 "Structural Removals".

E24.8.8 Conduit And Cable Installation

(a) Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic sized for free passage of conduit, and protruding 50 mm.

(b) If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

(c) Conduits for Bridge street lights, navigation lights, and River Level Monitoring System shall be installed and paid for in accordance with E24 "Electrical Conduits" and as shown on the Drawings.

E24.9 Quality Control

E24.9.1 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.

E24.9.2 Access

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

E24.9.3 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.

E24.9.4 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.

(c) Insulation resistance testing.

(i) Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

(ii) Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

(iii) Check resistance to ground before energizing.

(d) Submit test results for Engineer's Consultant's review.

E24.9.5 Inspection and Acceptance

(a) After the installation of the navigation lights 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 navigation lights are functioning satisfactorily.

(b) 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.

E24.10 Measurement and Payment

E24.10.1 Bridge Street Lights, Navigation Lights, River Level Monitoring System, and 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 the “Items of Work” listed here 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) Supply and install Bridge Street Lights, Navigation Lights, River Level Monitoring System, and Underbridge Light Fixtures.

E25. ELECTRICAL CONDUITS

E25.1 Description

(a) This Specification shall cover the supply and installation of Manitoba Hydro, MTS conduits, and City conduits within the sidewalk slab concrete abutments and tie-ins to existing manhole and the reinstallation of three (3) live MTS conduits.

(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.

E25.2 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.

E25.3 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; and

(ii) Temporarily relocating and reconnecting three live MTS conduits for the removal of and reconstruction of abutment backwalls and expansion joints.

E25.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of Work on Site, a conduit support system, that is sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(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.

E25.5 Materials

E25.5.1 General

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

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

(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.

E25.5.2 Manitoba Hydro Conduits

(a) The Contractor shall supply 4 - 125 mm and 3 - 100 mm diameter conduits identified on the Drawings as Manitoba Hydro ducts. The 125 mm conduits will be IPEX Rigid Super Duct, or equal as approved by the Contract Administrator, in accordance with B6 “Substitutes”. The conduit will be 100 mm 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.

E25.5.3 MTS Conduits

(a) The Contractor shall supply 3-100 mm diameter conduits identified on the Drawings as MTS ducts. The 125 mm conduit will be 125 mm IPEX Rigid Super Duct or equal, or approved by the Contract Administrator, in accordance with B6 “Substitutes”. The conduit will be 100 mm 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.

E25.5.4 City Conduits

(a) The shall supply 4-125 mm diameter conduits identified on the Drawings as City ducts. The 125 mm conduits will be IPEX Rigid Super Duct, or equal as approved by the Contract Administrator, in accordance with B6 “Substitutes”. The supply of the pipe will include the associated bends and couplings. The pipe will be supplied in standard 3 or 6 m lengths.

E25.6 Equipment

(a) This Specification shall cover the supply and installation of Manitoba Hydro and MTS conduits within the sidewalk slab concrete, and the reinstallation of there live MTS conduits.

(b) Refer to the materials specifications and the Drawings for equipment supplied by others.

E25.7 Construction Methods

E25.7.1 Conduit Support System

(a) The conduit support system shall be suitable for use in concrete and compatible with the conduit. It may consist of stainless steel reinforcing. It shall adequately support the conduit in its prescribed locations and prevent displacement of the conduit during concrete encasement on and off the structure. The conduit support system shall be engineered and a stamped drawing of support system shall be submitted to the Contract Administrator for acceptance. It shall be accepted by the Contract Administrator prior to use. The Contractor may employ the newly installed reinforcing steel anchors into the existing concrete deck to keep the conduits from floating as concrete is placed.

E25.7.2 MTS Standby Requirement

(a) The Contractor shall notify MTS whenever he is working on conduit installations in the event that MTS wishes to have one of their personnel on-site to observe the Contractor’s works.

E25.7.3 Placing of Conduit

(a) The conduit support system 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 conduit support system.

(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.

E25.7.4 Obstructions

(a) Upon completion of the conduit system, 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.

E25.7.5 Reinstallation of Temporary Relocated MTS Conduits

(a) There are three (3) MTS conduits on the underside of the Bridge deck that are to remain live during construction.

(b) Temporary relocation of these conduits is described in E8 “Structural Removals” and shall be paid in accordance with this Specification.

(c) The Contractor shall reinstall and reconnect all temporary relocated conduits noted above at locations of the new abutment backwalls and expansion joints.

(d) The Contractor shall coordinate with MTS as required to complete this Work.

E25.8 Quality Control

E25.8.1 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.

E25.8.2 Access

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

E25.8.3 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.

E25.9 Measurement and Payment

E25.9.1 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) 125 mm – Supply;

(ii) 125 mm - Install;

(iii) 100 mm – Supply;

(iv) 100 mm - Install;

(v) 50 mm – Supply;

(vi) 50 mm - Install;

(vii) 25 mm – Supply; and

(viii) 25 mm – Install.

E25.9.2 Reinstallation and Reconnection of MTS Conduits

(a) The reinstallation and reconnection of MTS conduits shall not be measured. This Work shall be paid for at the Contract Lump Sum price for "Reinstall and Reconnect MTS Conduits".which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

E26. ROADWAY LIGHTING

E26.1 As described elsewhere in this Specification, the Contractor will be responsible to supply and install the conduit and the anchors for the roadway lighting poles. The roadway lighting conductor and poles will be supplied and installed by Manitoba Hydro. The Contractor shall coordinate the work of Manitoba Hydro with his and ensure that Hydro has enough time to complete their works before the opening of the bridge to the public.

E27. EXPOSING EXISTING UNDERGROUND UTILITIES

E27.1 Description

(a) This Specification shall cover the exposing of existing larger diameter and high pressure gas lines and MTS ductlines prior to roadway excavation for the purpose of determining their actual elevation.

(b) Construction of the Osborne Street Bridge shall take place in two separate phases; Phase 1 Work will take place in 2011 and Phase 2 Work will take place in 2012. 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.

E27.2 Referenced Specifications and Drawings

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

(i) CW 2030 - Excavation Bedding and Backfill

E27.3 Material

E27.3.1 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.

E27.3.2 Backfill Material

(a) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand in accordance with CW 2030.

E27.4 Equipment

E27.4.1 General

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

E27.5 Construction Methods

E27.5.1 Hydro-Excavation

(a) Prior to any excavation taking place on site in the vicinity of the larger diameter and high pressure gas lines and MTS 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.

E27.5.2 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.

E27.6 Quality Control

E27.6.1 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.

E27.6.2 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.

E27.7 Measurement and Payment

E27.7.1 Exposing Existing Underground Utilities

(a) Hydro-excavation for exposing of larger diameter and high pressure gas lines and MTS ductlines shall not be measured. This item of Wrok 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.

E28. QUADGUARD CRASH CUSHION UNITS

E28.1 Description

(a) This Specification shall cover all operations related to supply and installation of a QuadGuard II System for the south abutment roadway slab and two QuadGuard CZ Systems to be temporarily installed at the ends of the temporary barriers between the completion of Phase 1A Bridge Work Construction and commencement of Phase 2 Bridge Work Removals, as herein specified 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.

E28.2 Referenced Specifications and Drawings

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

(i) AASHTO Publication – Roadside Design Guide.

E28.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing a QuadGuard II crash cushion unit for the south abutment roadway slab.

(ii) Supplying and installing a portable QuadGuard CZ crash cushion unit for the ends of the temporary barriers at the end of Phase 1A Bridge Work Construction; and

(iii) Removing and salvaging of the portable QuadGuard CZ crash cushion units at the end of the temporary barriers at the beginning of Phase 2 Bridge Work Removals.

E28.4 Submittals

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

E28.5 Materials

E28.5.1 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.

E28.5.2 QuadGuard II System

(a) The crash cushion system shall be QuadGuard II, designed and manufactured by Energy Absorption Systems Inc.

(b) The QuadGuard II System shall be capable of meeting the occupant risk criteria as recommended in the National Cooperative Highway Research Program (NCHRP 350). For vehicles weighing between 820 kg and 2000 kg, the theoretical impact velocity of a hypothetical front seat passenger against the vehicle's interior shall be less than 12 m/s, and the vehicle's highest 10 millisecond average acceleration subsequent to the instant of the hypothetical passenger impact shall be less than 20 G's.

(c) The QuadGuard II System shall be capable of redirecting 2000 kg vehicles which impact the sides of the system at speeds up to 100 km/h at angles of twenty (20) for both right-way and wrong-way impacts (angles measured from system's longitudinal centerline). The QuadGuard II System shall be capable of redirecting 820 kg vehicles, which impact the sides of the system at speeds up to 100 km/h at angles of fifteen (15).

(d) The QuadGuard II System shall be designed and constructed so there is no solid debris from the system which can create a hazard on the roadway after either headon or side angle design impacts.

(e) The QuadGuard II System shall be fully tested as per the recommended criteria set forth in the NCHRP Report 350, Test Level 3 for redirective, non-gating thermals and crash cushions.

(f) Metal work shall be fabricated from either M1020 Merchant Quality or ASTM A-36 steel. After fabrication, metal work shall be galvanized in accordance with ASTM A123. All welding shall be done by or under the direction of a certified welder.

(g) The system shall be assembled with galvanized fasteners. All bolts, nuts, and washers shall be Commercial Quality "American National Standard" unless otherwise specified.

E28.5.3 QuadGuard CZ System

(a) The crash cushion system shall be QuadGuard CZ, designed and manufactured by Energy Absorption Systems Inc.

(b) The QuadGuard CZ System shall be capable of redirecting 820 kg to 2000 kg vehicles which impact the sides of the system at speeds up to 100 km/h at angles of twenty (20) degrees for both right-way and wrong-way impacts (angles measured from system's longitudinal centerline). The 2000 kg vehicle shall include standard ¾ ton pickup trucks.

(c) For head-on impacts into the nose, the QuadGuard CZ System shall be capable of meeting the occupant risk criteria as recommended in NCHRP 350. For vehicles weight between 820 and 2000 kg, the impact velocity of a hypothetical front seat passenger against the vehicle's interior shall be less than 12 m/s, and the vehicles highest 10 millisecond average acceleration subsequent to the instant of the hypothetical passenger impact shall be less than 20 G's.

(d) The QuadGuard II System shall be designed and constructed so there is no solid debris from the system which can create a hazard on the roadway after either headon or side angle design impacts.

(e) The QuadGuard II System shall be fully tested as per the recommended criteria set forth in the NCHRP Report 350, Test Level 3 for redirective, non-gating thermals and crash cushions.

(f) Metal work shall be fabricated from either M1020 Merchant Quality or ASTM A-36 steel. After fabrication, metal work shall be galvanized in accordance with ASTM A123. All welding shall be done by or under the direction of a certified welder.

(g) The system shall be assembled with galvanized fasteners. All bolts, nuts, and washers shall be Commercial Quality "American National Standard" unless otherwise specified.

E28.6 Equipment

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

E28.7 Construction Methods

E28.7.1 QuadGuard II System

(a) The QuadGuard II System shall consist of energy absorbing cartridges surrounded by a framework of steel Quad-beam guardrail, which can telescope rearward during head-on impacts. The QuadGuard II System shall have a center monorail, which will resist lateral movement during side angle impacts, and a backup, which will resist movement during head-on impacts. The nose shall consist of a sheet steel wrap and an energy-absorbing cartridge. Transitions are available and may be required depending on site conditions.

(b) The installation of the QuadGuard II System attenuators shall be accomplished in accordance with the recommendations of Energy Absorption Systems Inc.

E28.7.2 QuadGuard CZ System

(a) The QuadGuard CS System shall consist of crushable cartridges surrounded by a framework of steel Quad-beam guardrail which can telescope rearward during head-on impacts. The QuadGuard CZ System shall have a center monorail, which will resist lateral movement during side angle impacts. The nose shall consist of a formed plastic nose wrap.

(b) The installation of the QuadGuard CZ System attenuators shall be accomplished in accordance with the recommendations of Energy Absorption Systems Inc.

E28.8 Quality Control

E28.8.1 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.

E28.8.2 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.

E28.9 Measurement and Payment

E28.9.1 Supply and Install QuadGuard II System

(a) Supplying and installing the QuadGuard II System shall be paid for at the Contract Unit Price per unit for “Supply and Install QuadGuard II System,”, 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.

E28.9.2 Supply and Install QuadGuard CZ System

(a) Supplying and installing the QuadGuard CZ System shall be paid for at the Contract Unit Price per unit for “Supply and Install QuadGuard CZ System,”, 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.

E28.9.3 Remove and Salvage QuadGuard CZ System

(a) Removing and salvaging the QuadGuard CZ System shall be paid for at the Contract Unit Price per unit for "Remove and Salvage QuadGuard CZ System,", 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.

E29. TRITON WATER FILLED TRAFFIC BARRIERS

E29.1 Description

(a) This Specification shall cover all operations relating to:

(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.

E29.2 Materials

E29.2.1 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.

E29.2.2 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..

E29.3 Construction Methods

E29.3.1 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.

E29.3.2 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.

E29.3.3 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.

E29.3.4 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.

E29.4 Measurement and Payment

E29.4.1 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.

E29.4.2 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.

E29.4.3 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.

E30. PRECAST CONCRETE BARRIERS

E30.1 Description

(a) This Specification covers the transportation, placement and assembly of precast concrete 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.

E30.2 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).

E30.3 Materials

E30.3.1 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.

E30.3.2 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.

E30.4 Equipment

E30.4.1 General

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

E30.5 Construction Methods

E30.5.1 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.

E30.5.2 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.

E30.5.3 Relocation of Precast Concrete Barriers

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

E30.5.4 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 personel and City's personnel shall inspect and inventory the barriers and all applicable components.

E30.6 Quality Control

E30.6.1 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.

E30.6.2 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.

E30.7 Measurement and Payment

E30.7.1 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.

E30.7.2 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.

E30.7.3 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.

E31. DETECTABLE WARNING SURFACE TILES

E31.1 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.

E31.2 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.

E31.3 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 (Refer to Appendix B);

(iv) SDE-229AA – Detectable Warning Surface in Curb Ramps for Intersection, Layout Option 1 (Refer to Appendix B);

(v) SDE-229AC – 300x300 Detectable Warning Surface Tile, Layout Option 3 (Refer to Appendix B);

(vi) SDE-229AD – 300x300 Detectable Warning Surface Tile, Layout Option 3 Detail (Refer to Appendix B);

(vii) SDE-229AE – Curb Ramp for Pedestrian Corridor with a Traffic Control Device (Refer to Appendix B);

(viii) SDE-229AF – Detectable Warning Surface Tile Orientation for Offset Intersections (Refer to Appendix B);

(ix) SDE – 229BB – Detectable Warning Surface in Curb Ramps for Medians (Refer to Appendix B);

(x) SDE-229E - Curb Ramp Depressed Curb (Refer to Appendix B); and

(xi) Installation Instructions for Cast in Place Inline Dome Detectable/Tactile Warning Surface Tile (Refer to Appendix B).

E31.4 Materials

E31.4.1 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.

E31.5 Approved Products

(a) Acceptable products for:

(i) 610 x 1220 mm (2'x 4') Armor-Tile Cast in Place (Federal Yellow)

(ii) 300 x 300 mm (1'x1') Armor-Tile cast in Place (Federal 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 Federal 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).

E31.6 Construction Methods

E31.6.1 Selection of Layout Options

(a) Select the appropriate design layout for detectable warning surface tiles according to the following prioritized order:

(b) Layout Option One – Install detectable warning surface tiles in accordance with SDE-229A and SDE-229AA.

(c) If two 610 x 1220 mm tiles would physically overlap each other, or would be within 150mm of each other, or if one tile would lie within the circulation path towards the other tile, then install the detectable warning surface tiles according to the following order, Layout Option Two or Three.

(d) Layout Option Two – Separate the tiles by moving either one or both tiles along the curb line in opposite directions, in accordance with this Specification, and keeping the ramp and pedestrian road crossing as perpendicular to the road as is possible, as directed by the Contact Administrator.

(e) Layout Option Three – Install detectable warning surface tiles in accordance with SDE-229AC and SDE-229AD

E31.6.2 General

(a) Construct curb ramps, sidewalk ramps and multi-use path in accordance with referenced Standard Construction Specifications, Standard Details, and SDE Drawings, in Appendix B.

(b) Detectable warning surface tile shall not be placed at private approaches or alleys.

(c) All curb ramps opposite each other shall have the same width.

(d) Construct the lip of the depressed curb in accordance with SDE-229E.

(e) Construct ramp slopes in accordance with SD-229C and SD-229D. Use a ramp slope with preference for a slope as close to 5% maximum as possible.

(f) Construct flare and curb taper slopes according to the following:

(i) If the curb taper is within a grassed area, construct the curb taper 900mm in length.

(ii) When the flare and curb taper are in a full width sidewalk and the sidewalk area at the top of the ramp is <1500 mm in width, construct the flare and curb taper at 5% slope to allow safe passage for wheelchairs in this area.

(iii) When the flare and curb taper are in a full width sidewalk and the sidewalk area at the top of the ramp is ≥ 1500 mm in width, construct the flare and curb taper at 10% slope.

(g) Install the detectable warning surface tile in accordance with the amended Installation Instructions, in Appendix B. Drill additional 6 mm air vent holes in ribs under the tile as required and use vibration to help seat the tile, to facilitate the installation process.

(h) Trim the corner of the tile at curb radii in accordance with SDE-229AA and SDE-229AD.

(i) Install the detectable warning surface tiles as shown on the referenced drawings in Appendix B or as directed by the Contract Administrator.

(j) Orient the detectable warning surface tiles perpendicular to the crossing direction.

(k) Locate gratings, access covers and other appurtenances outside of the sidewalk ramps, depressed curbs, rest areas, and gutters in front of the depressed curbs, as directed by the Contact Administrator

E31.6.3 Medians and Refuge Islands

(a) Where the distance from back of curb to back of curb is 1.32 m or greater, install one detectable warning surface tile 50 mm from the back of each curb.

(b) Where the distance from back of curb to back of curb is less than 1.32 m, leaving 50 mm between the back of curb and the tile, cut the tile(s) to fill the remaining area between the curbs.

E31.6.4 2.0 m Wide Depressed Curb for Multi-Use Paths

(a) Construct a curb ramp with a 2.0 m depressed curb at high volume collector and regional street intersections in accordance with SDE-229E, in accordance with Public Works Department guidelines and as directed by the Contract Administrator.

(b) Construct the concrete ramp 2.0 m wide and a minimum of 1.50m deep from back of curb.

(c) Construct the curb ramp in accordance with SD-229C and SD229D.

(d) Install one 610 mm x 1220 mm tile centered to the 2.0 m wide depressed curb. The part of the tile nearest the curb must be 50 mm form the back of curb similar to tile placement in SDE-229AA.

(e) Saw cut the middle of the concrete slab, perpendicular to the curb and to a depth of D/4. Cut additional sawcuts as directed by the Contract Administrator.

E31.6.5 3.5 m Wide Depressed Curb for Multi-Use Paths

(a) Construct a curb ramp with a 3.5m depressed curb at low volume collector and residential street intersections in accordance with SDE-229E, in accordance with Public Works Department guidelines and as directed by the Contact Administrator.

(b) Construct the concrete ramp 3.5m wide and a minimum of 1.50m deep from back of curb.

(c) Construct the curb ramp in accordance with SD-229C and SD229D.

(d) Install two (2) tiles in each concrete ramp, one (1) on each side for each direction. Place the short edge of each tile 150mm from the edge of the concrete ramp, with both tiles in line with each other transversely across the concrete ramp. The tile(s) nearest the curb must be 50mm from back of curb similar to tile placement in SDE-229AA.

(e) Saw cut the middle of the concrete slab, perpendicular to the curb and to a depth of D/4. Cut additional sawcuts as directed by the Contract Administrator.

E31.7 Measurement and Payment

E31.7.1 610 x 1220mm 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.

E31.7.2 300 x 300mm Detectable Warning Surface Tiles

(a) Supplying and installing detectable warning surface tiles shall be measured at the Contract Unit Price per unit for “300 x 300mm 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.

E31.7.3 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.

E31.7.4 Curb Ramp

(a) Curb ramp shall be paid for in accordance with CW 3240 or CW 3310.

E32. TRANSITION CURB AND MEDIAN BARRIER

E32.1 Description

(a) This Specification supplements the latest version of the City of Winnipeg Standard Construction Specification CW 3240 and covers the installation of “transition” curb adjacent to the bridge shoulder barrier as shown on the contract drawings. This curb transitions between the dowelled barrier curb and the shoulder barrier.

(b) This Specification supplements the latest version of the City of Winnipeg Standard Construction Specification CW 3240 and covers the installation of “transition” median barrier adjacent to the bridge median barrier as shown on the contract drawings. This curb transitions between the dowelled safety median and the median barrier.

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

E32.2 Referenced Specifications and Drawings

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

(i) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs; and

(ii) CW 3240 – Renewal of Existing Curbs.

E32.3 Referenced Standard Details

(a) The latest version of the City of Winnipeg Standard Details

(i) SD-205 – Barrier Curb (Dowelled); and

(ii) SD-226B – Safety Median.

E32.4 Materials

E32.4.1 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) In accordance with CW 3240, Section 2.

E32.5 Equipment

E32.5.1 General

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

E32.6 Construction Methods

E32.6.1 Transition Curb Installation

(a) Dowelled transition curb with dimensions as shown on the Drawings is to be installed in accordance with CW 3240, Section 3.3 and SD-205, complete with reinforcement.

(b) Dowelled transition median barrier with dimensions as shown on the Drawings is to be installed in accordance with CW 3235 and SD-226B, complete with reinforcement.

E32.7 Quality Control

E32.7.1 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.

E32.7.2 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.

E32.8 Measurement and Payment

E32.8.1 Construction of Transition Curb

(a) Constructing transition curb shall be paid for at the Contract Unit Price per metre for "Transition Curb Installation", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E32.8.2 Construction of Transition Median Barrier

(a) Constructing the transition median barrier shall be paid for at the Contract Unit Price per metre for "Transition Median Barrier", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E33. RECYCLED CONCRETE BASE COURSE MATERIAL

E33.1 Description

(a) Further to the latest version of the City of Winnipeg Standard Construction Specification CW 3110, this specification covers supply and placement of recycled concrete base course material for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks.

(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.

E33.2 Definitions

(a) Deleterious material – are materials such as vegetation, organic material, wood, glass, plastic, metal, reinforcing steel, building rubble, brick, salvaged asphalt materials, clay, shale, and friable particles.

E33.3 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specification
  (i) CW 3110 – Sub-Grade. Sub-Base and Base Course Construction;
  (ii) CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints;
  (iii) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs; and
  (iv) CW 3325 – Portland Cement Concrete Sidewalk.

E33.4 Materials

E33.4.1 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.

E33.4.2 Recycled Concrete Base Course Material

(a) Recycled concrete base course material when used for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks will be considered equal to granular or limestone base course material specified in Section 2.2 CW 3110.

(b) Recycled concrete base course material will be approved by the Contract Administrator.

(c) Recycled concrete base course material will consist of sound durable particles produced by crushing, screening, and grading of recovered concrete materials, free from soft material that would disintegrate through decay or weathering.

(d) The recycled concrete base course material will be well graded and conform to the following grading requirements:

TABLE 13.1: RECYCLED CONCRETE BASE COURSE MATERIAL GRADING REQUIREMENTS

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE
20 000	100%
5 000	40%-70%
2 5000	25%-60%
315	8%-25%
80	6%-17%

(e) Recycled concrete base course material when subjected to the abrasion test will have a loss of not more than 35% when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

(f) The amount of deleterious material will be limited to a maximum of two percent of the total dry weight.

E33.5 Equipment

E33.5.1 General

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

E33.6 Construction Methods

E33.6.1 Placement of Recycled Concrete Base Course Material

(a) Place and compact recycled concrete base course material as a levelling course to a maximum thickness of 50 millimetres.

(b) Spread materials uniformly to avoid segregation free of pockets of fine and coarse material.

(c) Level and compact to the finished elevation. Compact to 100% Standard Proctor Density for Full-Depth Partial Slab Patches (Class A, B, C, & D) and 90% Standard Proctor Density for miscellaneous concrete slabs and sidewalks.

(d) Maintain the finished material until the pavement or sidewalk is placed.

E33.7 Quality Control

E33.7.1 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.

E33.7.2 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.

E33.8 Measurement And Payment

E33.8.1 Recycled Concrete Base Course Material

(a) Supplying, placing and compacting recycled concrete base course material shall be paid for at the Contract Unit Price per cubic metre for the “Supplying and Placing Base Course Material” as specified in accordance with CW 3110.

(b) No measurement or payment will be made for material placed as a levelling course under miscellaneous concrete slabs and sidewalks where the costs are included in accordance with CW 3235 and CW 3325.

(c) No measurement or payment will be made for materials rejected by the Contract Administrator.

E34. PROTECTION OF EXISTING TREES

E34.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

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

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

(c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

(d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the Work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

(e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E34.2 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.

E34.3 No separate measurement or payment will be made for the protection of trees.

E34.4 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.

E35. WATER OBTAINED FROM THE CITY

E35.1 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.

E36. SURFACE RESTORATIONS

E36.1 Further to clause 3.3 of the latest version of the City of Winnipeg Standard Construction Specification CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E37. SALT TOLERANT GRASS SEEDING

E37.1 Description

(a) Further to the latest version of the City of Winnipeg Standard Construction Specification CW 3520 and CW 3540, this Specification shall cover sub-grade preparation and the supply and placement of salt tolerant grass seed.

E37.2 Materials

E37.2.1 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.

E37.2.2 Salt Tolerant Grass Seed

(a) Salt tolerant grass seed for regional and collector boulevards, medians and interchange areas shall be a mixture composed of:

(i) Seventy percent (70%) Fults or Nuttals Alkaligrass (Puccinellia spp.), twenty percent (20%) Audubon or Aberdeen Creeping Red Fescue and ten percent (10%) Perennial Ryegrass.

E37.3 Equipment

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

(b) Scarification equipment shall be suitable for the area being scarified, shall be capable of scarifying the sub-grade to the specified depth and shall be accepted by the Contract Administrator. For confined areas a toothed bucket may be acceptable. For larger areas tilling equipment may be required.

E37.4 Construction Methods

(a) Preparation of Existing Grade

(i) Prior to placing topsoil, in areas to be seeded greater in width than 600 mm, prepare the existing sub-grade by scarifying to a minimum depth of 75 mm and to a maximum depth of 100 mm to the satisfaction of the Contract Administrator.

(ii) Scarification shall consist of breaking up and loosening the sub-grade. No scarification shall occur within the edge of a tree canopy (or drip line).

(b) Salt Tolerant Grass Seeding

(i) Salt Tolerant Grass Seed shall be sown at a rate of 2.2 kilograms per 100 square meters.

E37.5 Quality Control

E37.5.1 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.

E37.5.2 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.

E37.6 Measurement and Payment

E37.6.1 Salt Tolerant Seeding

(a) Supplying, placing and maintaining salt tolerant grass seed will be paid for at the Contract Unit Price per square metre for "Salt Tolerant Seeding", 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. Payment for salt tolerant grass seeding shall be in accordance with the following:

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

(ii) Remaining thirty five (35%) percent of quantity following termination of the Maintenance Period.

E38. CONSTRUCTION OF TINTED CONCRETE

E38.1 Description

(a) This Specification shall cover the construction of “red” tinted concrete pavement, intended to delineate the Southbound Transit only lane at the intersection at Osborne Street and River Avenue. The tinted concrete is finished at grade and is the width of the travel lane. Care must be taken with consistency in water/cement ratio and finishing as the color can be affected load to load.

(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.

E38.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards:

(i) ASTM C309 – Standard Specification of Liquid Membrane – Forming Compounds for Curing Concrete;

(ii) CW 3310 – Portland Cement Concrete Pavement Works; and

(iii) CAN3 A266.5 – Guideline for the Use of Superplasticizing Admixtures in Concrete.

E38.3 Materials

E38.3.1 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.

E38.3.2 Concrete Materials

(a) The Contractor shall base the tinted concrete mix on a mix design that has been approved for the current construction season by the City of Winnipeg Research and Standards Department.

(b) The base mix design shall conform to Section 6 of CW 3310 with the following alterations:

(i) Type 1 mix as per Section 6.2 of CW 3310

(ii) Slump for hand placement shall be 80 mm +/- 20 mm prior to adding superplasticizers (if needed) to facilitate finishing without adding water to the surface.

(c) Alterations to the base mix design will be considered by the Contract Administrator if necessary to account for the concrete tint material and finishing operations.

E38.3.3 Concrete Tint

(a) “Red” coloured metal oxide pigment shall be used to permanently color ready-mix concrete.

(b) Approved Product List

(i) Lafarge Red (Premium) supplied through L.M. Scofield Company; and

(ii) SG160-2 Sunrise Red supplied through L.M. Scofield Company.

(c) The Contractor shall cast one coloured concrete sample, minimum 200 mm X 200 mm in area using base concrete mix for approval by Contract Administrator.

(d) Tinted concrete shall not be placed until sample color has been accepted by the Contract Administrator. The Contractor shall demonstrate that the sample will achieve the approximate color advertised by the pigment supplier using local concrete mix materials.

E38.3.4 Superplasticizers

(a) Superplasticizers shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA CAN3-A266.5 and CAN3-A266.6, but must be compatible with the air-entraining agent. The agent shall be free of chlorides and shall not affect the air-entraining agent's ability to produce a satisfactory air void system.

E38.3.5 Liquid Membrane-Forming Curing Compound

(a) Curing Compound shall be clear (no pigment), and water based conforming to the requirements of the latest edition and all subsequent revisions of ASTM C309.

E38.3.6 Other Materials

(a) All other materials shall be in accordance with CW 3310.

E38.3.7 Floating and Finishing Equipment

(a) Use only wood or magnesium floats. Bull floats used for initial finishing shall be constructed of wood only.

E38.4 Equipment

(a) All other equipment shall be in accordance with CW 3310.

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

E38.5 Construction Methods

E38.5.1 General

(a) Concrete formwork, steel reinforcement, placement, curing, and joint sealing shall be in accordance with CW 3310 except as modified in the following clauses.

(b) As shown on the Drawings, construct formed 50 mm headers to define the lane edge and transverse termination of at-grade coloured concrete where the adjacent pavement is to be asphalt overlaid.

(c) Clean finishing tools and equipment and let dry prior to finishing. Wet tools will fade the colouring. Wetting of tools during finishing operation is not permitted.

(d) Place concrete at a consistent slump. No water shall be added on Site. Superplasticizer may be added at a rate suggested by the concrete supplier if additional workability is needed.

(e) No localized water spray or fogging is permitted to assist in finishing as this will locally fade the colour.

(f) Only clear curing compound only shall be used. The use of water curing or plastic film is not allowed. Plastic film for insulation in cold weather must be approved by the Contract Administrator.

E38.6 Quality Control

E38.6.1 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.

E38.6.2 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.

E38.7 Measurement and Payment

E38.7.1 Construction of Tinted Concrete

(a) Constructing tinted concrete shall be paid for at the Contract Unit Price per square metre for "Construction of 230 mm Concrete Pavement (Plain-Dowelled, Tinted)", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The area to be paid for will be the total number of square meters of tinted concrete supplied and placed at grade, or below an asphalt overlay in accordance with this specification and accepted by the Contract Administrator.

E39. BARRIER CURB AT #60 OSBORNE STREET NORTH

E39.1 Description

(a) This Specification shall cover all concreting operations related to construction of concrete barrier curb along the back of sidewalk immediately in front of 60 Osborne Street North (Great West Life Assurance Company). The required height of barrier curb varies from 150 mm to 300 mm above sidewalk finished surface and has a consistent width of 300 mm along the entire section.

(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.

E39.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards::

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

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

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

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

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

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

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

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

(ix) CW 3310 – Portland Cement Concrete Pavement Works

E39.3 Materials

E39.3.1 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.

(c) Materials shall be in accordance with CW 3310.

E39.4 Equipment

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

E39.5 Construction Methods

(a) Construction shall take place in accordance with CW 3310.

(b) Damage to existing irrigation systems resulting from Contractor activities will be repaired by the Contractor. Costs of irrigation system repairs will be incidental to Work.

E39.6 Quality Control

(a) Quality Control shall be in accordance with CW 3310.

E39.7 Measurement and Payment

E39.7.1 Varying Height Barrier Curb

(a) Supplying and installing the varying height barrier curb shall be paid for at the Contract Unit Price per metre for “Barrier (300mm width, Separate)”, 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 amount to be paid for will be the total number of lineal metres supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E40. TRANSIT BUS STOP CONCRETE FOUNDATIONS

E40.1 Description

(a) This Specification shall cover all concreting operations related to construction of heated shelter foundations and bus stop flag foundations in accordance with this Specification 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.

E40.2 Referenced Standard Construction Specifications

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

(i) CW 3310 – Portland Cement Concrete Pavement Works

E40.3 Materials

E40.3.1 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.

E40.3.2 Handling and Storage of Materials

(a) Storage of materials shall be in accordance with the latest edition and all subsequent revisions of CAN/CSA A23.1.

E40.3.3 Testing and Approval

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

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

E40.3.4 Cement

(a) Cement shall be Type HS or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of the latest edition and all subsequent revisions of CAN/CSA A23.1.

E40.3.5 Concrete

(a) General

(i) Concrete repair material shall be compatible with the concrete substrate.

(b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with the latest edition and all subsequent revisions of CAN/CSA A23.1:

(i) Class of Exposure: C-1

(ii) Compressive Strength @ 56 days = 35 MPa

(iii) Water / Cementing Materials Ratio = 0.4

(iv) Air Content: Category 2 per Table 4 of CAN/CSA A23.1 (4-7%)

(v) Cement – shall be as specified in E40.3.4

(c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.

(d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self compacting concrete may be used for the foundations.

(e) The temperature of all types of concrete shall be between 15˚C and 25˚C at discharge. Temperature requirements for concrete containing silica fume shall be between 10˚C and 18˚C at discharge unless otherwise approved by the Contract Administrator.

(f) Concrete materials susceptible to frost damage shall be protected from freezing.

E40.3.6 Aggregate

(a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with CAN/CSA A23.1.

(b) Coarse Aggregate

(i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with t CAN/CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in CAN/CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".

(ii) Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; and shall have an absorption not exceeding 2.25%.

(iii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, and excess of thin particles or any other extraneous material.

(iv) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.

(v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

(c) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, Gradation FA1.

(ii) Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.

(iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in the CAN/CSA A23.1, Table 12.

E40.3.7 Cementing Materials

(a) Cementing materials shall conform to the requirements of the CAN/CSA A3001.

(b) Silica Fume

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

(c) Fly Ash

(i) Fly ash shall be Type CI or Type F and shall not exceed 25% 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 formation of lumps shall not be used in the Work.

E40.3.8 Admixtures

(a) Air entraining admixtures shall conform to the requirements of ASTM C260.

(b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators, and air-reducing agents will not be permitted, unless otherwise approved by the Contract Administrator.

(d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.

E40.3.9 Water

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

E40.3.10 Concrete Supply

(a) Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CAN/CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.

(b) Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within 120 minutes after the introduction of the mixing water to the cementing materials and aggregates.

(c) The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E40.3.11 Reinforcing Steel

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

(b) All reinforcing steel shall conform to the requirements of CAN/CSA G30.18, Grade 400W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars. All bars, including ties, shall be hot-dip galvanized in accordance with CAN/CSA G164-M92 for a minimum net retention of 610 g/m^2. Reinforcing steel supply and installation will be incidental to construction of concrete foundation and no separate payment will be made.

E40.3.12 Anchor Bolts, Nuts, and Washers

(a) Anchor bolts, nuts, and washers shall be supplied by the Contract Administrator.

(b) Anchor bolt supply and installation will be incidental to construction of concrete foundation and no separate payment will be made.

E40.3.13 Anchor Bolt Templates

(a) Anchor bolt templates shall be supplied by the Contract Administrator.

(b) Anchor bolt templates will be incidental to construction of new concrete foundation and no separate payment will be made.

E40.3.14 Miscellaneous Materials

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

E40.4 Equipment

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

E40.5 Construction Methods

E40.5.1 Bus Stop Flag Foundation

(a) Miscellaneous

(i) Remove and store existing bus stop flag and metal base. Store such that bus stop flag is not damaged or scratched. Install metal base and bus stop flag after new foundation is cured.

(ii) Remove existing bus bench and reinstall in new location using suitable stainless steel hardware.

(b) Excavation

(i) The Contractor is responsible for determining the excavation method at each foundation location.

(ii) Excavations for foundations shall be made with equipment designed to remove a core of the diameter shown on the Drawings, or hydro-jet excavation to a depth to bypass and/or expose adjacent utilities.

(iii) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.

(iv) All excavated material from the foundations shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.

(v) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after boring has been completed.

(c) Sleeving

(i) Timber or steel sleeving shall be used to temporarily line the bore to prevent bulging or caving of the walls and to protect men at work in the bore.

(ii) The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

(iii) The sleeving shall be withdrawn as the concrete is placed in the bore. The sleeving shall extend at least 1.0 m below the top of the freshly deposited concrete at all times.

(iv) The clearance between the face of the bore hole and the sleeving shall not exceed 75 mm.

(d) Inspection of Bores

(i) Concrete shall not be placed in a bore until the bore has been inspected and approved by the Contract Administrator.

(ii) The Contractor shall have available suitable light for the inspection of each bore throughout its entire length.

(iii) All improperly set sleeving, bore, or bottom shall be corrected to the satisfaction of the Contract Administrator.

(e) Placing Reinforcing Steel

(i) Reinforcement shall be:

(ii) placed in accordance with the details shown on the Drawings

(iii) rigidly fastened together, and

(iv) lowered into the bore intact before concrete is placed.

(v) Spacers shall be utilized to properly locate the reinforcing steel cage in the bore.

(f) Placing Anchor Bolts

(i) The anchor bolts shall be aligned with a steel template supplied by the Contract Administrator matching the bolt holes in the sign structure base plate. Extreme

care shall be used in this operation to ensure bolts are aligned properly. Placement of anchor bolts without the steel template will not be permitted.

(ii) The threaded portion of the anchor bolts projecting above the top surface of foundation shall be coated with oil, before the concrete is poured, to minimize the fouling of threads splattered by concrete residue.

(g) Placing Metal Bases

(i) Contractor to relocate existing flag foundation metal base and flag following curing of concrete foundations.

(ii) Metal bases are to be installed plumb, level, and flush to the concrete foundation. Contractor to use stainless steel washers to level bases as required.

(h) Placing Concrete

(i) Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts and conduits are properly positioned prior to placement of concrete.

(ii) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the foundation.

(iii) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the foundation shall be finished smooth and even with a hand float.

(iv) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator.

(i) Protection of Newly Placed Concrete

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

(j) Curing Concrete

(i) The top of the freshly finished concrete foundations shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10ºC for at least seven (7) consecutive days thereafter.

(ii) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

(iii) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.

(iv) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3º in one hour or 20º in twenty-four hours.

E40.5.2 Heated Shelter Foundation

(a) Removal and Reinstallation of Shelter

(i) The Contract Administrator will arrange for temporary removal of the existing shelter, including removal of the bench and disconnection of the power supply.

(ii) The Contract Administer will arrange for reinstallation of the shelter, bench, and reconnection of the power supply after all work complete.

(b) Excavation

(i) The Contractor is responsible for determining the excavation method at each foundation location.

(ii) Do not disturb existing power supply conduit and wiring when removing paving stones and sidewalk.

(c) Placing Reinforcing Steel

(i) Reinforcement shall be:

(ii) placed in accordance with the details shown on the Drawings

(iii) rigidly fastened together.

(d) Placing Concrete

(i) Care shall be taken to ensure that reinforcing steel is properly positioned prior to placement of concrete.

(ii) Power supply conduit to be properly positioned prior to concrete placement.

(iii) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the foundation.

(iv) Placing of concrete shall be in accordance with the latest version of the City of Winnipeg Standard Construction Specification CW 3310 and as shown on Drawings.

(e) Protection of Newly Placed Concrete

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

(f) Curing Concrete

(i) The top of the freshly finished concrete foundations shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10ºC for at least seven (7) consecutive days thereafter.

(ii) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

(iii) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.

(iv) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3º in one hour or 20º in twenty-four (24) hours.

(g) Form Removal

(i) Forms shall not be removed for a period of at least twenty-four (24) hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

(ii) The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

(iii) Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E40.6 Quality Control

E40.6.1 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.

E40.6.2 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.

E40.7 Measurement and Payment

E40.7.1 Construction of Cast-in-Place Concrete Foundations

(a) Construction of cast-in-place concrete foundations shall not be measured. This Work shall be paid for at the Contract Lump Sum Price per foundation for the "Items of Work" listed here below for concrete foundations constructed, 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) Cast-in-Place Concrete Foundations;

(i.) Heated Shelter Foundation; and

(ii.) Bus Stop Flag Foundation.

E41. CRASH ATTENUATION BARRELS

E41.1 Description

(a) This Specification shall cover all operations related to the installation and maintenance of the crash attenuation barrels.

(b) Barrels will be placed in a nine (9) barrel configuration as shown one 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.

E41.2 Materials

E41.2.1 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.

E41.2.2 Crash Attenuation Barrels

(a) Crash attenuator barrels complete with fill sand and miscellaneous hardware shall be supplied to the Contractor by the City of Winnipeg. The crash attenuation barrel manufacturer product data sheet shall be submitted to the engineer for approval prior to supply and installation.

E41.3 Equipment

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

(b) All components shall be handled in a careful and workmanlike manner. The components shall be stored on timber blocks or built-up platforms. Smaller sized components such as fasteners and miscellaneous hardware shall be stored separately in suitable bins.

E41.4 Construction Methods

E41.5 Crash Attenuation Barrels

(a) Crash attenuator barrels complete with fill sand and miscellaneous hardware shall be supplied to the Contractor by the City of Winnipeg. The crash attenuation barrel manufacturer product data sheet shall be submitted to the engineer for approval prior to supply and installation.

(b) The Contractor shall be responsible for the pickup and delivery of the crash attenuation barrels and all applicable components to the site. The Contractor shall supply equipment capable of lifting and loading the barrels at the City yard and safely transporting to, and unloading the barriers at the site. Any damage occurring to the barrels during loading, transporting and unloading shall be repaired at the Contractor's expense.

(c) Prior to leaving the yard the Contractor's personnel shall inspect the barrels 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 barrels.

(d) The barrels are located at:

City of Winnipeg Public Works Bridge Yard
849 Ravelstone Ave. W.
Phone: 204-794-8510
Contact: Mr. Mike Terleski, CET

(e) A minimum noticeof twenty-four (24) hours shall be required prior to pick up of the barrels. Once the barrels have been hauled to Site they shall be carefully unloaded, placed and assembled at the locations indicated on the Drawings.

(f) The Contractor shall be responsible for loading, hauling, unloading and storing of the crash attenuation barrels. The Contractor shall supply all necessary equipment for loading, hauling, unloading and storing of the components.

(g) The Contractor shall be responsible for relocating the barrels as necessary during various Phases of the Work.

E41.6 Quality Control

E41.6.1 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.

E41.6.2 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.

E41.7 Measurement and Payment

E41.7.1 Installation of Crash Attenuation Barrels

(a) Installing crash attenuation barrels shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Install Crash Attenuation Barrels", 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.

E42. SIDEWALK CONSTRUCTION

E42.1 Description

(a) This Specification shall cover the installation of concrete sidewalk as identified on the Drawings, including areas under indicator strip paving stones and paving patterns/fields.

(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.

E42.2 Referenced Specifications and Drawings

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

(i) CW 3310 – Portland Cement Concrete Pavement Works

E42.3 Materials

E42.3.1 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.

(c) Concrete mix design shall comply with Clause 6.2a) of the latest version of the CW 3310

(d) All other materials as per Clause 5 of the latest version of the CW 3310.

E42.4 Equipment

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

E42.5 Construction Methods

(a) Construction shall take place in accordance with the Drawings and the CW 3310 and CW 3325.

(b) Blockouts for all indicator strip paving stones and paving pattern/fields in sidewalk to be constructed as shown on the Drawings. All forming is incidental to the unit price Bid for this specification.

(c) Verify dimensions of unit pavers prior to construction of the blockouts. Gaps between pavers and concrete pavement in excess of 6 mm (1/4”) will be rejected.

(d) Meet existing grades and slopes unless otherwise indicated on the Drawings. Notify the Contract Administrator where this requirement will not result in positive drainage.

(e) Thickened sidewalk or thickened edge of sidewalk will be incidental to the unit price Bid for the concrete sidewalk.

(f) Damage to existing irrigation systems resulting from Contractor activities will be repaired by the Contractor. Costs of irrigation system repairs shall be incidental to the Work.

(g) Removal of existing paving stone shall be incidental to the Work.

E42.6 Quality Control

E42.6.1 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.

E42.6.2 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.

E42.7 Measurement and Payment

E42.7.1 Construction of Concrete Sidewalk

(a) Constructing the concrete sidewalk shall be paid for at the Contract Unit Price per square metre for “Sidewalk”, measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The area to be paid for shall be the total number of square metres of sidewalk constructed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E43. PAVING STONES

E43.1 Description

(a) Further to the latest version of the City of Winnipeg Standard Construction Specification CW 3335, this Specification shall cover the:

(i) Supplying and installing of interlocking paving stones (unit pavers) used in paving pattern/fields and as indicator strips;

(ii) Supplying and installing of sand setting bed; and

(iii) Supplying and installing of grout.

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

(c) Removal of existing paving stone will be incidental to the unit bid price for sidewalk removal.

E43.2 Referenced Specifications and Drawings

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

(i) CW 3330 – Installation of Interlocking Paving Stones; and

(ii) CW 3335 – Installation of Interlocking Paving Stones on a Lean Concrete Base.

E43.3 Materials

E43.3.1 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.

E43.3.2 Interlocking Paving Stones

(a) Concrete interlocking paving stones (unit pavers) for bus stop indicator paver squares, supplied by:

Barkman Concrete
Phone: 204-667-3310
Contact: Wayne Wiebe

As shown on the Drawings and as follows:

(i) Supply and Install 60mm Paving Stones

(iv) Transit Blue Holland Paver 60x105x210mm

(b) Concrete interlocking paving stones (unit pavers) for indicator strips and paving areas/fields shall be clay brick pavers conforming to ASTM C902. Type 1, dimensional tolerance: 1/8", wire cut face, solid (not cored) as manufactured by Endicott Clay Products Company and supplied by:

Alsip Industrial Products Ltd.
Winnipeg, MB
Phone: (204) 667-3330
Contact: Jason Alsip

Or equal as accepted by the Contract Administrator in accordance with B6 "Substitutes". Color shall be manganese ironspot:

(i) Supply and Install 60 mm Paving Stones

(i) Endicott Clay Brick Paver 60x102x204 mm

E43.3.3 Sand

(c) Clean brick sand as joint filler.

(d) Clean brick sand as minimum 13mm depth setting bed.

(e) Bedding sand shall be fine aggregate as specified in Specification CW 3330.

E43.3.4 Grout

(a) Grout as specified hereinafter shall be used for grouting paving stone under 50mm x 50mm in size. The grout shall have a compressive strength of 25 MPA at 28 days, determined on 50 mm cubes stored and tested in accordance with ASTM C109, and shall consist of normal Portland cement, sand and water;

(b) The water-cement ratio shall be kept in the range of 0.45 to 0.55;

(c) The grout shall have between 3% and 5% entrained air;

(d) Acryl-Stix or approved equal, as accepted by the Contract Administrator in accordance with B6 "Substitutes" to be used in grout at approximately 4 litres Acryl-Stix to 3 litres water;

(e) Admixtures to be used in the grout shall be supplied in accordance with the requirements of CW 3310;

(f) The grout shall be of a consistency suitable for the application intended as approved by the Contract Administrator;

(g) The Contractor shall provide the Contract Administrator with a mix design statement certifying the constituent materials and mix proportions that will be used in the grout for approval prior to construction.

E43.4 Equipment

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

E43.5 Construction Methods

E43.5.1 Installation of Indicator Strip Paving Stones in Blockouts

(a) Paving stones shall be installed in formed concrete blockouts in accordance with CW 3330, set in locations and patterns as shown on the Drawings. Spaces between joints shall not exceed 3 mm, and shall be uniform and consistent while maintaining true patterns as indicated on the Drawings.

(b) Contractor to verify the exact dimensions of pavers prior to construction of block outs in concrete sidewalk.

(c) Remove and dispose of existing paving stones in existing sidewalk.

(d) Install concrete sidewalk complete with block-outs for paving stones as specified on Drawings.

(e) Install sand bed to minimum 13 mm depth as shown on the Drawings.

(f) Do not compact setting bed prior to installation of pavers.

(g) Spread only sufficient area which can be covered with pavers same day.

(h) In areas where pavers are to be grouted in place, clean existing concrete, install grout bed and then place pavers on grout.

(i) Grout between pavers as required ensuring stability.

(j) Remove adjacent pavers in patterns as required to ensure that bricks do not require cutting to fit existing paving pattern.

(k) Where paving pattern is interrupted by vertical structural elements, pavers must be sawcut and fit true and hand tight.

(l) Commence installation of pavers against edge to obtain straightest possible course for installation.

(m) Pavers shall be cut with a saw only, to obtain true even undamaged edges. Chipped pavers are unacceptable.

(n) Crews shall work on installed pavers, not on sand layer.

(o) Spread and fine grade brick sand over paving surface and sweep into joints, in several directions. Sand is incidental to the price for supply and installation of pavers.

(p) Compact pavers with vibratory plate compactor having mass of at least 113kg. Compaction is incidental to the price for supply and installation of paving stone.

(q) Sweep remaining sand over all paving areas until joints are full and remove excess from Site.

(r) Remove cracked, chipped, broken or otherwise damaged paving materials from Site immediately.

(s) Upon completion, clean in accordance with manufacturer's recommendations.

E43.5.2 Installation of Grouted Paving Stones Over Structural Slabs

(a) Clean surfaces which are to receive grouted paving stones to ensure removal of grease, oil and dust film.

(b) Apply latex cementitious levelling coat wherever slight substrate irregularity exists.

(c) Install paving stones to maintain uniform joint appearance and minimize cutting.

(d) Lay out paving stones as indicated so that perimeter and cut units are no less than half size.

(e) Set paving stones in place while bond coat is wet and tacky, prior to skinning over. Slide units back and forth to ensure a proper bond and level surface. Avoid slippage.

(f) Clean backs of paving stones and back butter to ensure a 95 % bond coverage.

(g) Clean excess mortar from surface prior to final set.

(h) Keep 2/3 of depth of grout joints free of setting material.

(i) Allow proper setting time prior to grouting. Sound thin set units after setting materials have cured and replace hollow sounding units before grouting.

(j) Force grout into joints to ensure dense finish.

(k) Remove excess.

(l) If cutting of existing concrete sidewalk is required, this shall be incidental to the pay item described in this specification.

E43.5.3 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 inspection of approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

E43.6 Measurement and Payment

E43.6.1 Interlocking Paving Stones

(a) Interlocking paving stone work will be measured on an area basis and will be paid for at the Contract Unit Price per square metre for “Items of Work”, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.The area to be paid for shall be the installed area of paving stones.

(a) Items of Work:

Supply and Install 60mm Paving Stones

(i) Endicott Clay brick Paver 60x102x204mm (Manganese Ironspot); and

(ii) Transit Blue Holland Paver 60x105x210mm.

E44. PLANTERS AND PLANTER EDGING

E44.1 Description

E44.1.1 General

(a) This Specification shall cover the construction of planters at the north end of the Bridge, including excavation, and supply and installation of granular base for edging, paver edging, growing medium and mulch.

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

E44.2 Referenced Specifications and Drawings

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

(i) CW 1120 - Existing Services, Utilities and Structures

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

(iii) CW 3330 – Installation of Interlocking Paving Stones

E44.3 Materials

E44.3.1 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.

E44.3.2 Paver Edging

(a) Heavy duty flexible style prefabricated aluminum or PVC paver edging, suitable for 60 mm depth stone paving units. Acceptable product: Pave Edge Flexible Pro, manufactured by Pave Tech, O Box 576, Prior Lake, MN 55372, phone: (952) 226-6400. Submit 900mm sample for approval.

E44.3.3 Anchors and Hardware

(a) Connectors: matched connector rods supplied by manufacturer.

(b) Anchors: 250mm long x 9mm diameter spiral, galvanized timber spikes.

E44.3.4 Granular Base Course (Below Edging)

(a) Crushed Gravel Base Course material in accordance with CW 3110, Depth 150 mm.

E44.3.5 Growing Medium

(a) Topsoil in accordance with CW 3540

E44.3.6 Mulch

(a) Mulch shall be clean bark or wood chip free of leaves, branches and other extraneous matter, consisting of chips not less than 15 mm nor larger than 75 mm in size and not more than 20 mm thick.

E44.4 Equipment

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

E44.5 Construction Methods

E44.5.1 Excavation

(a) Excavate in accordance with CW 3170, to a depth of 300mm from the top of the sidewalk. Base of excavation shall be smooth soil, free of lumps or debris.

(b) Do not over-excavate existing soil beside or under the limits of excavation required for the installation. If soil is over-excavated, install compactable fill material in lifts not more than 200mm deep and compact to the required density.

(c) Confirm that the depth of the excavation is accurate to accommodate the depths of base course and growing medium throughout the extent of the excavation.

E44.5.2 Sub-Grade Compaction

(a) Compact sub-grade below the edging to a minimum of 95% standard Proctor Density, in accordance with CW 3170.

(b) Compact sub-grade below planting medium to a minimum of 85% Standard Proctor Density.

E44.5.3 Installation of Granular Base (Below Edging)

(a) Install base to the depths indicated on the Drawings in accordance with CW 3110. Compact base layer to a minimum of 95% standard Proctor Density.

(b) Grade surface in a plane parallel to the grades of the paving above.

E44.5.4 Installation of Edging

(a) Identify the outline layout of the edging and the edges of paving using spray paint or chalk line. Obtain approval from Contract Administrator.

(b) Spike flexible paving into compacted base using approved anchors through molded holes in the edging, maximum spacing 300 mm.

(c) Connect additional sections of edging as needed (see Section 2.1, C-4 for connection) Connection piece shall provide complete end-to-end contact on all pavement facing edges without piece-to-piece lippage. Connection device shall extend beyond splice at least 50 mm in each direction from splice.

(d) Cut edging pieces accurately to create continuous perimeter restraint without gaps or buckles.

E44.5.5 Installation of Growing Medium

(a) Once pavers have been installed in accordance with CW 3330, remove all rubble, debris, dust and silt that may have accumulated in the planter excavation, and install growing medium to 300 mm depth in two 150 mm lifts. Lightly compact between lifts.

E44.5.6 Installation of Mulch

(a) Install mulch uniformly over soil to depth indicated on the Drawings.

E44.5.7 Planting

(a) Annual planting shall be by others.

E44.5.8 Clean-up

(a) Perform cleanup during the installation of work and upon completion of the work. Maintain the site free of soil and sediment, free of trash and debris. Remove from site all excess soil materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

E44.6 Quality Control

E44.6.1 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.

E44.6.2 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.

E44.7 Measurement and Payment

E44.7.1 Construction of Planter and Planter Edging

(a) Constructing planter and planter edging shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed 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. Assembly does not include planters or paving.

(b) Items of Work:

(i) Construction of north west planter and paver edging; and

(ii) Construction of north east planter and paver edging.

Appendix A Osborne Bridge 2009 Condition Survey

Appendix B Standard Construction Specifications, Standard Details, And Sde Drawings For Detectable Warning Surface Tiles

Appendix C Navigable Waters Permit

Appendix D Power Supply and Enclosure for LED Lighting