



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 398-2015**

**NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK  
REHABILITATION**

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## **PART B - BIDDING PROCEDURES**

### **B1. CONTRACT TITLE**

B1.1 NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK REHABILITATION

### **B2. SUBMISSION DEADLINE**

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 20, 2015.

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. ENQUIRIES**

B3.1 All enquiries shall be directed to the Contract Administrator identified in D2.2(a).1.

B3.2 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.

B3.3 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.

B3.4 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.

B3.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

### **B4. CONFIDENTIALITY**

B4.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:

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

B4.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Bid Opportunity to the media or any member of the public without the prior written authorization of the Contract Administrator.

### **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/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- 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/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B6.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.
- B6.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.
- 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/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with 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.
- B7.5 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/her own name, his/her name shall be inserted;
- (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
- (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
- (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

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/her own name, it shall be signed by the Bidder;
- (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
- (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;
- (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

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.

B9.2 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).

B9.5 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 copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (b) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (c) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>).

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/her 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/her Bid after the Submission Deadline but before his/her 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/her Bid or in other information required to be submitted, that he/she 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 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.

**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/her Bid upon written request to the Contract Administrator.

## **PART C - GENERAL CONDITIONS**

### **C0. GENERAL CONDITIONS**

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at [http://www.winnipeg.ca/matmgt/gen\\_cond.stm](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:

- (a) Mobilization and Demobilization
- (b) Pavement Removal
- (c) Structural Concrete
- (d) Deck Repairs
- (e) Elastomer Waterproofing Membrane
- (f) Construction of Asphaltic Concrete Pavements

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

- (a) Mobilization and Demobilization
- (b) Pavement Removal
  - (i) Diamond Grind Concrete Deck
  - (ii) Removal of Abutment Roof Slab Concrete
  - (iii) Removal of Header Concrete
  - (iv) Removal of Concrete at Areas of Low Cover
  - (v) Removal of Concrete at Areas of Corroded Reinforcing
- (c) Structural Concrete
  - (i) Concrete Pavement for Abutment Roof Slabs
  - (ii) Concrete Pavement for Header
- (d) Deck Repairs
  - (i) Type 1 Spall Repair
  - (ii) Type 2 Exposed Reinforcing Repair
  - (iii) Type 3 Corroded Reinforcing Repair
  - (iv) Galvanic Anodes
- (e) Elastomer Waterproofing Membrane
  - (i) Application of Elastomer Waterproofing Membrane
  - (ii) Supply and Installation of Rubber Membrane and Wick Drains
- (f) Construction of Asphaltic Concrete Pavements
  - (i) Main Line Paving
- (g) Reflective Crack Maintenance

#### **D3. CONTRACT ADMINISTRATOR**

D3.1 The Contract Administrator is AECOM Canada Ltd., represented by:  
Matthew Miller, EIT  
Structural Engineer-in-Training, Bridges

Telephone No. 204 793-6669  
Email Address. Matthew.Miller@aecom.com

D3.2 At the pre-construction meeting, Matthew Miller will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D3.3 Bids Submissions must be submitted to the address in B7.8.

#### **D4. CONTRACTOR'S SUPERVISOR**

D4.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

#### **D5. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE**

D5.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D5.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D5.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

- (a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;
- (b) the Contract, all deliverables produced or developed; and
- (c) any statement of fact or opinion regarding any aspect of the Contract.

D5.4 A Contractor who violates any provision of D5 may be determined to be in breach of Contract.

#### **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 facsimile number identified in D2.2(a).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  
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 facsimile number:

The City of Winnipeg  
Legal Services Department  
Attn: Director of Legal Services  
Facsimile No.: 204 947-9155

D6.5 **Bids Submissions** must be submitted to the address in B7.8

## 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/her 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>

D9.3 Notwithstanding B10.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

### 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 five million dollars (\$5,000,000.00) 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, rip and tear, endorsement and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
- (b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.
- (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

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 All policies shall be taken out with insurers licensed to and carrying on business in the Province of Manitoba;
- D10.5 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

#### **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.
- (a) The Contractor shall provide the Contract Administrator with an updated work schedule every two weeks following the award date.
- 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 Work for **each Stage of Construction** as well as showing those activities/tasks on the critical path:

- (a) Stage 1 Commencement
- (b) Stage 2 Commencement
- (c) Stage 3 Commencement
- (d) Traffic Control Installation/Removal;
- (e) Pavement Removals
  - (i) Diamond Grind Concrete Deck
  - (ii) Removal of Concrete at Areas of Low Cover
  - (iii) Removal of Concrete at Areas of Corroded Reinforcing
  - (iv) Removal of Header Concrete
  - (v) Removal of Abutment Roof Slab Concrete
- (f) Type 3 Corroded Reinforcing Repair
  - (i) Galvanic Anodes
  - (ii) Repair
  - (iii) Cure Time
- (g) Type 2 Exposed Reinforcing Repair
- (h) Type 1 Spall Repair (Trafficguard EP35)
- (i) Concrete Pavement for Headers
  - (i) Repair
  - (ii) Cure Time
- (j) Concrete Pavement for Abutment Roof Slabs
  - (i) Repair
  - (ii) Cure Time
- (k) Elastomer Waterproofing Membrane
- (l) Installation of Wick Drains
- (m) Construction of Asphaltic Concrete Pavements
- (n) Substantial Performance
- (o) Total Performance

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.  
R3B 1L1

## **SCHEDULE OF WORK**

### **D15. COMMENCEMENT**

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

- D15.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
    - (i) evidence of authority to carry on business specified in 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; and
    - (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 three (3) Working Days of receipt of the letter of intent.
- D15.4 The City intends to award this Contract by June 19, 2015
- D15.4.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

## **D16. SUBSTANTIAL PERFORMANCE**

- D16.1 The Contractor shall achieve Substantial Performance by August 31, 2015.
- D16.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.
- D16.3 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.

## **D17. TOTAL PERFORMANCE**

- D17.1 The Contractor shall achieve Total Performance by September 8, 2015.
- D17.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.
- D17.3 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.

## **D18. LIQUIDATED DAMAGES**

- D18.1 If the Contractor fails to achieve Substantial Performance in accordance with the Contract by the day fixed herein for Substantial Performance, the Contractor shall pay the City twenty five hundred dollars (\$2500) per Working Day for each and every Working Day following the day fixed herein for Substantial Performance during which such failure continues.

- D18.2 If the Contractor fails to achieve Total Performance in accordance with the Contract by the day fixed herein for Total Performance, the Contractor shall pay the City five hundred dollars (\$500) per Working Day for each and every Working Day following the day fixed herein for Total Performance during which such failure continues.
- D18.3 The amount specified for liquidated damages in D18.1 and D18.2 are based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial Performance or Total Performance by the day fixed herein for same.
- D18.4 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

#### **D19. SCHEDULED MAINTENANCE**

- D19.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Reflective crack maintenance during one year maintenance. Warranty as specified in CW 3250-R7.
- D19.2 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**

##### **D20. JOB MEETINGS**

- D20.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.
- D20.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

##### **D21. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)**

- D21.1 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).

##### **D22. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS**

- D22.1 Further to B10.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B10.4.

## **MEASUREMENT AND PAYMENT**

### **D23. PAYMENT**

- D23.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

## **WARRANTY**

### **D24. WARRANTY**

- D24.1 Notwithstanding C13.2, the warranty period shall begin on the date of Substantial Performance and shall expire one (1) year thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

**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. 398-2015

NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK REHABILITATION

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. 398-2015

NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK  
REHABILITATION

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

\_\_\_\_\_  
(Name of Contractor)

\_\_\_\_\_  
(Address of Contractor)

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

\_\_\_\_\_ Canadian dollars.

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

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

Partial drawings are permitted.

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

\_\_\_\_\_  
(Address)

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

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

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

\_\_\_\_\_  
(Date)

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

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

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

\_\_\_\_\_  
(Name of bank or financial institution)

Per: \_\_\_\_\_  
(Authorized Signing Officer)

Per: \_\_\_\_\_  
(Authorized Signing Officer)





**FORM K: EQUIPMENT**  
(See D13)

**NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK REHABILITATION**

<b>1. Category/type:</b>	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
<b>2. Category/type:</b>	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
Make/Model/Year: _____	Serial No.: _____
Registered owner: _____	
<b>3. Category/type:</b>	
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)

**NORWOOD NORTHBOUND BRIDGE OVER THE RED RIVER - 2015 BRIDGE DECK REHABILITATION**

<p><b>4. Category/type:</b></p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p><b>5. Category/type:</b></p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p><b>6. Category/type:</b></p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>

## 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:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
B103-15-01	CT-00_Cover Page and Location Plan
B103-15-02	CT-01_Plan View – Limits of Material Placement
B103-15-03	CT-02_Plan View – Asphalt Design Grades and Limits of Work
B103-15-04	CT-03_Plan View – Cover Depth Measurements
B103-15-05	CT-04_Pavement Profile – 1 of 2
B103-15-06	CT-05_Pavement Profile – 2 of 2
B103-15-07	CT-06_Miscellaneous Details – Page 1 of 2
B103-15-08	CT-07_Miscellaneous Details – Page 2 of 2
B103-15-09	CT-08_Traffic Signing Plan Stage 1 – Median Lane Closure
B103-15-10	CT-09_Traffic Signing Plan Stage 2 – Center Lane Closure
B103-15-11	CT-10_Traffic Signing Plan Stage 3 – Gutter Lane Closure

### GENERAL REQUIREMENTS

#### E2. VERIFICATION OF WEIGHTS

- E2.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.
- E2.1.1 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.
- E2.1.2 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:
- (a) Checking Contractor's scales for Consumer & Corporate Affairs certification seals.
  - (b) Observing weighing procedures.
  - (c) 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.
  - (d) Checking tare weights shown on delivery tickets against a current tare.
- E2.1.3 No charge shall be made to The City for any delays or loss of production caused by such inspection and verification.

E2.2 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.

E2.2.1 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

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

### **E3. MOBILIZATION AND DEMOBILIZATION**

E3.1 Description

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

E3.2 Scope of Work

E3.2.1 The Work under this specification shall include but not be limited to:

- (a) Mobilizing and demobilizing on-site Work facilities;
- (b) Supplying, setting up, laying out, and removing site office facilities as detailed in E4 "Office Facilities"
- (c) Traffic Control and Traffic Management as detailed in E5 "Traffic Control", and E6 "Traffic Management".

E3.3 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.

E3.4 Equipment

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

E3.5 Construction Methods

E3.5.1 Layout of On-Site Work Facilities

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

E3.5.2 Cellular Telephone Communication

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

E3.5.3 Restoration of Existing Facilities

- (a) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities.

### E3.6 Method of Measurement

Mobilization and demobilization shall be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

### E3.7 Basis of Payment

Mobilization and demobilization will be paid for at the Contract Lump Sum Prices for "Mobilization and Demobilization".

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

- |  |     |
|--|-----|
| (a) When Contract Administrator is satisfied that construction has commenced | 40% |
| (b) During construction  | 50% |
| (c) Upon completion of the project   | 10% |

## E4. OFFICE FACILITIES

E4.1 The Contractor shall supply office facilities meeting the following requirements:

- (a) The building shall be conveniently located near the site of the Work.
- (b) The building shall have a minimum floor area of 25 square metres, a height of 2.4m with a window and a door entrance with a suitable lock.
- (c) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18°C or 24-25°C.
- (d) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.
- (e) The building shall be furnished with one desk, one drafting table, table 3m x 1.2m, one stool, one four drawer legal size filing cabinet, and a minimum of 12 chairs.
- (f) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.
- (g) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he deems it necessary.

E4.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E4.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

## E5. TRAFFIC CONTROL

E5.1 Description

- (a) The Work covered under this item shall include all operations related to establishing and executing the public access and traffic control plan as hereinafter specified.
- (b) The Work includes furnishing all superintendence / overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work associated with the public access and traffic control.

E5.2 Notification

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

### E5.3 Construction Methods

#### E5.3.1 General

- (a) The Contractor will be responsible for pedestrian and traffic control at the Site as acceptable to the Contract Administrator.
- (b) For traffic control in the immediate Work area, the Contractor shall erect and maintain 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", issued by the City of Winnipeg.
- (c) The Contractor shall provide and maintain flagmen in accordance with the above mentioned manual.
- (d) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the 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.
- (e) In accordance with the Manual of Temporary Traffic Control in Work Areas on City Streets, the Contractor ("Agency" in the manual) shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place all temporary regulatory signs. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.
- (f) 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.
- (g) Improper signing will be sufficient reason for the Contract Administrator or Inspector to immediately shut down the entire job.
- (h) 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.
- (i) 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.
- (j) Intersecting street and private approach access shall be maintained at all times, as noted on the Staging Drawings.
- (k) 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 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.
- (l) Pedestrian passage must be maintained in a safe manner acceptable to the Contract Administrator.
- (m) Where directed, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as planning drop-offs and built up headers to the satisfaction of the Contract Administrator. Asphalt ramps are not required if the Contractor follows the proposed Staging Plan.

### E5.4 Measurement and Payment

- (a) Traffic Control is considered incidental to “Mobilization and Demobilization” and no separate payment will be paid for the Work.

## **E6. TRAFFIC MANAGEMENT**

### **E6.1 Further to clause 3.7 of CW 1130-R1:**

E6.1.1 Maintain a minimum of two lanes at all times on northbound Main Street through the construction zone. No disruption of traffic shall be permitted on southbound Main Street at any time during construction. It is recommended that the Contractor work in accordance with the Traffic Signing Plan Lane Closure drawings. Pedestrian access must be maintained throughout the sidewalk and active transportation lane behind the traffic barrier.

E6.1.2 Stage 1 Construction (Median Lane Closure) – Marion Avenue median lane is to be closed first, followed by St Mary’s Road. The modified left turn lane shall be made as long as possible for vehicle storage and deceleration.

E6.1.3 Stage 2 Construction (Center Lane Closure) – Flagmen and appropriate safety must be maintained during the center lane construction as all the work will be isolated between flowing traffic.

E6.1.4 Stage 3 Construction (Gutter Lane Closure) – Equipment storage may be permitted north of the closed lanes during this stage.

### **E6.2 Description**

- (a) This Specification shall cover all operations relating to the provision of safe access for vehicles, pedestrians and cyclists around the construction.
- (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.

### **E6.3 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 traffic;
  - (iii) The provision of all other measures necessary to ensure safe 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.

### **E6.4 Submittals**

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

### **E6.5 Materials**

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

### **E6.6 Equipment**

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



**E6.7 Safety Precautions**

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

**E6.8 Quality Control**

- (a) 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.

**E6.9 Measurement and Payment**

- (a) Traffic Management shall be considered incidental to "Mobilization and Demobilization" and no separate payment will be paid for the Work.

**E7. WATER OBTAINED FROM THE CITY**

- E7.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

**E8. DIAMOND GRINDING**

**E8.1 Description**

**E8.1.1 General**

- (a) This specification covers the Diamond Grinding of existing concrete pavements.

**E8.2 Equipment**

**E8.2.1 Grinding Machine**

- (a) The grinding machine shall be self-propelled complete with a mounted grinding head with diamond blades capable of grinding a minimum width of 1.2 meters designed for grinding and texturing pavement. The machine shall have a minimum total weight of 15,876 kilograms (including the grinding head) and an effective wheel base of no less than 3.65 meters.
- (b) The grinding machine shall have a positive means of vacuuming the grinding slurry residue from the pavement surface, leaving the pavement surface in a clean, near-dry condition.
- (c) All equipment shall be maintained to ensure it is in proper working order. The "roundness" of the match and depth control wheels of the grinding machine shall be regularly monitored; any wheels found to be out of round shall be immediately replaced.
- (d) Any equipment that causes ravelling, aggregate fractures or disturbance to the pavement joints shall not be permitted.

**E8.2.2 Inertial Profiler**

- (a) The Inertial Profiler shall conform to the Class 1 requirements in accordance with the latest revision of ASTM E-950.
- (b) The Inertial Profiler must be properly calibrated and certified for use for the current construction season. Acceptable certification shall be Mn/DOT or approved equal.
- (c) Documentation of the certification must be provided to Contract Administrator prior to commencement of any measurements.

## E8.3 Construction Methods

### E8.3.1 Pavement Grinding

- (a) The pavement grinding shall be scheduled and completed on the mainline pavement lanes in a manner that produces a neat, uniform finished surface.
- (b) The pavement shall be ground in the longitudinal direction parallel to the pavement center line.
- (c) Mainline grinding shall be completed to within 150mm of the face of barriers.
- (d) Removals to the edge of barriers are required by other means, such as chipping hammer or hydro-demolition, if the mainline grinding is unable to cut to the edge of barriers. Removal of the top 15mm of concrete is required to the inside face of barriers and extending to within the area of proposed header. The vertical face shall be a clean vertical surface flush with the face of barriers.
- (e) Grinding shall be completed in a manner that removes joint or crack faults and maintains lateral drainage and constant cross slope. The maximum allowable difference between the adjacent sides of joints and cracks shall be 2mm.
- (f) The maximum grinding depth shall not exceed 20mm, with the exception of headers and abutment roof slabs, if this method is chosen to be used in these areas.
- (g) The Contractor shall be responsible for arranging and supplying all water required for the project. Water obtained for the City of Winnipeg shall be in accordance with E7.

### E8.3.2 Final Surface Finish

- (a) The grinding process shall produce a pavement surface that is true in grade and uniform in appearance with a smooth finish. If the grinding head does not permit a completely smooth finish a longitudinal line-type texture shall be applied with a maximum height between ridges of 1.5 mm. The finished grooves shall be evenly spaced 2 to 3 mm apart.
- (b) The Contractor shall be responsible for the selection of the number and type of blades to be used to provide the proper surface finish for the aggregate type and waterproofing membrane requirements. Unbroken fins shall be removed to the satisfaction of the Contract Administrator.
- (c) The Contractor shall be responsible to determine the proper sequence of operations to meet the specification. Multiple passes may be required to meet the specifications.
- (d) Localized depressed pavement areas and areas of spalling will be exempt from texture and smoothness requirements. Additional grinding of these areas may be required and will be as directed by the Contract Administrator.

### E8.3.3 Slurry Removal

- (a) The Contractor shall remove and dispose of all grinding slurry in a manner and at a location to satisfy environmental regulations.
- (b) All slurry removal operations shall be approved by the Contract Administrator.
- (c) No grinding slurry shall be allowed to flow across lanes occupied by traffic or enter into closed drainage systems.
- (d) All grinding slurry for this project shall be disposed of off-site.

### E8.3.4 Slurry Handling

- (a) The grinding slurry to be removed from the site shall be collected in water-tight haul units and transported to disposal facilities as listed in E8.3.5 of this specification.

### E8.3.5 Slurry Disposal Sites

- (a) The Contractor shall dispose of grinding slurry at the designated disposal sites provided by the City of Winnipeg. The disposal sites for the individual streets are as follows:

- (i) City of Winnipeg South End Pollution Control Centre snow dump site.
  - (ii) City of Winnipeg McPhillips Street snow dump site.
  - (iii) City of Winnipeg Bangor Avenue snow dump site.
- (b) The Contractor shall ensure that the site is only utilized for disposal of the material from this project. The site shall be secured at all times.
  - (c) At completion of the grinding disposal operations, the Contractor shall clean up the sites to the satisfaction of the Contract Administrator.
  - (d) The site clean-up shall include removal of excess water, removal of remaining grinding solids and regrading of the site to original condition prior to commencement of the grinding disposal operations.

#### E8.3.6 Smoothness Requirements

- (a) The Contractor shall be responsible for all profile testing to meet the requirements of this contract.
- (b) All testing shall be continuous and be run in the direction of the traffic. Stationing shall be provided by the Contract Administrator and for all testing.
- (c) The Profiler shall be operated at optimum speed as defined by the manufacturer.
- (d) Prior to performing any grinding work, the Contractor shall provide a control profilograph trace. The control trace will be used to identify the required smoothness for the project.
- (e) All testing shall be reported in 100 metre segments complete with a summary of all dip and bump measurements and locations.
- (f) Upon completion of the grinding operations, acceptance measurements shall be completed.
- (g) The Contractor shall run the profile in both wheel paths of each individual lane and average the resulting IRI results to determine acceptance. The profiles shall be run 0.9 meters from each lane line. A guide shall be used to ensure proper alignment of the profile. The Contract Administrator will have a representative present during all testing periods.
- (h) Each lane will be evaluated separately in 100 metre segments. The finished surface shall have a final IRI of 1.2 m/km.
- (i) The Contractor shall regrind, at no additional cost, any areas found not meeting the smoothness requirements.
- (j) The finished ground surface shall not include any bumps exceeding 5mm in 7.5 meters.
- (k) Areas of depressed pavement due to localized causes and areas that have reached the maximum removal will be excluded from the smoothness requirements. These areas shall be reviewed and approved by the Contract Administrator.
- (l) The Contractor shall provide a print out of all smoothness measurements, a profilogram and a copy of the raw profile data in an unfiltered ERD file format.

#### E8.4 Measurement and Payment

##### E8.4.1 Diamond Grind Concrete Deck

- (a) Diamond Grinding will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Diamond Grind Concrete Deck." The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.
- (b) No additional payment will be made if multiple passes of the grinding equipment are required to meet the smoothness requirements. The area of the pavement ground will only be considered for payment once, unless regrinding is directed by the Contract Administrator for reasons other than inadequate smoothness.

- (c) No additional payment will be provided for testing to net the smoothness requirements of this contract.
- (d) No additional payment will be provided for removals to the edge of barriers.

## **E9. CONCRETE REMOVAL**

### **E9.1 Description**

- (a) This Specification shall cover all operations relating to the removal and disposal of miscellaneous existing concrete, as specified herein and as shown on the Drawings. This Specification shall cover concrete removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, and disposal of applicable materials.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

### **E9.2 Scope of Work**

- (a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator.
- (b) This section of Work comprises of the following concrete removals:
  - (i) Removal of the abutment roof slab concrete top 40 mm± of the Norwood Northbound Bridge;
  - (ii) Removal of the header concrete, top 15mm± to 40 mm± of the Norwood Northbound Bridge concrete deck in the location of the proposed 5m long concrete headers;
  - (iii) Removal of the areas of low cover, top 15 mm± of the Norwood Northbound Bridge concrete deck via hand chipping;
  - (iv) Removal of the concrete at areas of corroded reinforcing, to a depth of 30 mm below reinforcing steel on the Norwood Northbound Bridge.
- (c) Removing concrete with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way into the watercourse. No demolition products shall find their way onto the sidewalk or roadway lanes which are open to traffic. Limits of demolition shall be saw cut to provide a clean edge at the extent of demolition. Repair any over demolition and damaged reinforcing steel to the satisfaction of the Contract Administrator, at no additional cost.
- (d) All concrete removal materials not identified for salvage shall revert to the Contractor for off-site disposal.

### **E9.3 Submittals**

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any 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 five (5) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule, clearly illustrating the method and sequence by which he proposes to perform the concrete removals, including a description of the measures that will be implemented to meet the environmental requirements. The demolition procedure shall include a description of the following:
  - (i) Type and capacity of equipment;
  - (ii) Sequence of operations;
  - (iii) Design of demolition products protection of traffic lanes.
- (c) If the Contractor so chooses to implement hydro demolition methods of removal, he 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 hydro-demolition runoff control and disposal methods and procedures. Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers, prior to entering the City's land drainage sewer system. Bridge deck drain openings shall be plugged during any hydro-demolition process. At no time can runoff of wastewater be permitted to enter the watercourse or the City's land drainage system unfiltered.

#### E9.4 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.

#### E9.5 Equipment

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

#### E9.6 Demolition Barriers

- (a) The Contractor shall provide all necessary temporary barriers to protect the general public and facilitate concrete removals and associated inspection of all Works by the Contract Administrator.
- (b) The use of explosives is prohibited.

#### E9.7 Construction Methods

##### E9.7.1 General

- (a) Concrete removals shall be deemed to include all the items of work as listed under Clause E9.2(b) of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.
- (b) The Contractor shall prevent damage and destructive vibrations of existing structures to remain, services, expansion joints, and adjacent roadways. If safety of the structure being removed, existing structures or services appears to be endangered the contractor shall cease operations and notify the Contract Administrator immediately.
- (c) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.
- (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 of the contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.
- (e) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any neighbouring roadways or sidewalks during removal operations.
- (f) The Contractor shall visit the site to become familiar with the existing conditions and scope of work prior to bid submission. No allowance for extras will be made for any concrete removals, not foreseen by the Contractor, required to complete the scope of work.
- (g) The details and dimensions of the existing structures shown on the Drawings are for assisting the Contractor in establishing methods and limits of removal and for determining the cost of the Work. All available Drawings for the existing bridge structure and modifications are available for viewing with the Contract Administrator. No guarantee for the accuracy of the information is given. No allowance for extras will be given for information on the Drawings that does not represent existing conditions.

- (h) 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.
- (i) The Contractor shall provide all necessary access to facilitate concrete removals and subsequent inspection of all the Works by the Contract Administrator.
- (j) 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.
- (k) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures. For partial removal of concrete, edges shall be saw-cut to clean and straight lines.
- (l) The abutment roof slabs and proposed header areas are to have final surface scarification by high pressure water jet (hydro-demolition wand) before application of new concrete.
- (m) Following the initial removal of concrete, the Contract Administrator shall conduct a delamination survey to determine if any additional concrete removal will be required. These areas will be clearly marked out on the deck surface for the Contractor by the Contact Administrator.
  - (i) Any reinforcing steel that is severed shall be replaced, with appropriate lap lengths, by the Contractor to the satisfaction of the Contract Administrator at no additional cost to the City.
  - (ii) Any reinforcing steel that exhibits cross sectional loss or other loss of epoxy coating shall receive a coat of 100% solids, non-conductive epoxy installed as per the manufacturer's specifications.
- (n) The Contractor shall only use methods of concrete removal that will not damage the existing structural steel or new structures. Care must be taken in areas of low cover to terminate the diamond grinding before contact is made with the existing reinforcing steel.
- (o) Limits of demolition shall be saw cut to provide a clean edge at the extent of demolition.

#### E9.7.2 Removal of Abutment Roof Slab Concrete

- (a) Removal of Abutment Roof Slab Concrete shall be the removal of concrete in the areas shown on the Drawings to a nominal depth of 40 mm measured from the top of the existing concrete deck surface. The minimum removal depth shall be 35 mm.
- (b) All of the existing reinforcing steel is to remain in place. The Contractor shall ensure that the reinforcing steel is not damaged.

#### E9.7.3 Removal of Header Concrete

- (a) Removal of concrete at headers shall take place in areas shown on the Drawings to a nominal depth of 40 mm measured from the top of the existing concrete deck surface next to locations of the expansion joint bulkhead, tapering to 15 mm at 5 m distance from the bulk head.
- (b) All of the existing reinforcing steel is to remain in place. The Contractor shall ensure that the reinforcing steel is not damaged.

#### E9.7.4 Concrete Removal at Areas of Low Cover

- (a) Removal of concrete at areas with low existing cover shall take place in the approximate areas shown on the Drawings to a nominal depth of 15 mm measured from the top of the existing concrete deck surface.
- (b) Drawing Sheet 01 shows areas of concrete cover less than 25mm where only a portion of this area is expected to require concrete removal by means other than diamond grinding.

- (c) Approximately 40m<sup>2</sup>, most of which will be located in the left turn lanes, will require careful removal of concrete because the reinforcing is within 15mm of the roadway surface. Diamond Grinding shall not be used for removal at these locations.
- (d) All of the existing reinforcing steel is to remain in place. The Contractor shall ensure that the reinforcing steel is not damaged.

#### E9.7.5 Concrete Removal at Areas of Corroded Reinforcing

- (a) Removal of concrete at areas of corroded reinforcing shall take place in the approximate areas shown on the Drawings to a nominal depth of 30 mm below reinforcing steel.
- (b) Drawing Sheet 01 shows areas of concrete cover less than 25mm where only a portion of this area is expected to exhibit corroded reinforcing.
- (c) Approximately 15m<sup>2</sup>, most of which is located in the left turn lanes, exhibit corrosion of the reinforcing steel located near the surface of the existing roadway.
- (d) This area will require careful removal of concrete because the reinforcing is within 15mm of the roadway surface and is currently exposed and visible from the surface. Diamond Grinding shall not be used for removal at these locations.
- (e) All of the existing reinforcing steel is to remain in place. The Contractor shall ensure that the reinforcing steel is not damaged.

#### E9.7.6 Bridge Deck Surface Preparation Works for Concrete Overlay

- (a) The final surface preparation of the Bridge deck at locations of concrete overlay shall be conducted by water jet unless otherwise approved by the Contract Administrator. The resulting surface shall achieve the required grades, while being roughened to the following requirements:
  - (i) Concrete shall be removed by water jet to a "Scabbled" profile, in accordance with the ICRI Guideline 03732 CSP8.
- (b) Prior to the commencement of the removal operation the hydro-demolition 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) 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.
- (e) Where applicable, any "shadowing" of the reinforcing steel by concrete not removed by the process of hydro-demolition shall be removed by the Contractor through other approved means.

- (f) After the hydro-demolition 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 hydro-demolition equipment or chipping hammers.
- (g) Upon completion of the hydro-demolition of each section of the concrete deck, the Contractor shall remove all cuttings, slurry containing the products of hydro-demolition, and all other debris from the resulting concrete surface so as to produce a thoroughly clean surface. Cleaning of each section shall be done before debris and water are allowed to dry on the deck surface and prior to the placement of cathodic protection.

## E9.8 Quality Control

### E9.8.1 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.

### 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

- (a) Removal of the existing abutment roof slabs will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Removal of Abutment Roof Slab Concrete." The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.
- (b) Removal of the header concrete will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Removal of Header Concrete." The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.
- (c) The removal of concrete at areas of low cover will be measured on an area basis and paid for at the Contract Unit Price per square metre (m<sup>2</sup>) for "Removal of Concrete at Areas of Low Cover". The area to be paid for will be the total number of square metres of concrete removal in accordance with this specification, accepted and measured by the Contract Administrator.
- (d) The removal of concrete at areas of corroded reinforcing will be measured on an area basis and paid for at the Contract Unit Price per square metre (m<sup>2</sup>) for "Removal of Concrete at Areas of Corroded Reinforcing". The area to be paid for will be the total number of square metres of concrete removal in accordance with this specification, accepted and measured by the Contract Administrator.
- (e) Bridge deck surface preparation shall not be measured. This item of Work shall be considered incidental to the removal of concrete deck.

## E10. STRUCTURAL CONCRETE

### E10.1 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.

#### E10.2 Scope of Work

- (a) Supplying and placing Concrete Pavement for Abutment Roof Slab;
- (b) Supplying and placing Concrete Pavement for Headers;
- (c) Supplying and placing structural concrete for Type 3 Corroded Reinforcing Repair;

#### E10.3 Submittals

##### E10.3.1 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.

##### E10.3.2 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](http://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 of 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 to CSA A23.1-04 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.

### E10.3.3 Concrete Mix Design Test Data

- (a) Concrete
  - (i) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.
  - (ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural 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<sub>i</sub>) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 15, Fibre Reinforced Structures, Clause 16.6.
  - (iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.
- (b) Aggregates
  - (i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.
  - (ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.
  - (iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.
  - (iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.
  - (v) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as

judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

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

#### E10.3.4 Notification of Ready Mix Supplier

- (a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least ten (10) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

#### E10.3.5 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.

#### E10.3.6 Concrete Pour Sequence and Schedule

- (a) The Contractor shall complete the Type 3 Corroded Reinforcing Repairs first to achieve the moisture requirements before the waterproofing membrane may be applied.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to scheduled commencement of concrete placement, the proposed concrete placement schedule for all other structural concrete placements of this Specification.

### E10.4 Materials

#### E10.4.1 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.

#### E10.4.2 Handling and Storage of Materials

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

#### E10.4.3 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 E10.1.

TABLE E10.1 REQUIREMENTS FOR HARDENED CONCRETE							
Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	Headers, Abutment Roof Slabs, Type 1 Repair	35 @ 28 Days	C-1	1	20 mm	Corrosion Inhibitor, Synthetic Fibres Wet Cured	0.15

E10.4.4 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 A23.2-27A-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 is required.
- (iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

- (i) Fine aggregate shall meet the grading requirements of CSA A23.1-04, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.
- (ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12.

(c) Coarse Aggregate - Standard

- (i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-04, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.
- (ii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.

- (iii) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
- (iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12, for concrete exposed to freezing and thawing.

#### E10.4.5 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.

#### E10.4.6 Cementitious Materials

- (a) Cementitious materials shall conform to the requirements of CSA-A3001 and shall be free from lumps.
- (b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.
- (c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.
- (d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

#### E10.4.7 Water

- (a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1-04 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

#### E10.4.8 Corrosion Inhibitor

- (a) Corrosion inhibitor shall be MCI 2005 NS, or equal as accepted by the Contract Administrator, in accordance with B6. Dosage shall be 1 L/m<sup>3</sup>.

#### E10.4.9 Synthetic Fibres

- (a) The synthetic fibres shall consist of 100% virgin polypropylene as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (R<sub>i</sub>) and fibre dispersion in accordance to the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6.

#### E10.4.10 Formwork

- (a) Formwork materials shall conform to CSA Standard A23.1-04, and American Concrete Publication SP4, "Formwork for Concrete."
- (b) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (c) 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.
- (d) All formwork fastener holes drilled in to existing concrete deck must be filled with epoxy grout before casting concrete overlay.

#### E10.4.11 Curing Compound

- (a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.
- (b) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B6.

#### E10.4.12 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.

#### E10.4.13 Bonding Agents

- (a) Latex Bonding Agent
  - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.
- (b) Bonding Grout
  - (i) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
    - ◆ 1 part water;
    - ◆ 1 part latex bonding agent; and
    - ◆ 1½ parts Type GUSF Portland cement.
  - (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

#### E10.4.14 Epoxy Grout

- (a) Epoxy grout for filling drilled holes, cored drain pipe holes, or traffic barrier chamfers 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.

#### E10.4.15 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.

### E10.5 Equipment

#### E10.5.1 General

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

#### E10.5.2 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 of Type 3 Corroded Reinforcing Repairs.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

### E10.5.3 Placing and Finishing Equipment for 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.

### E10.6 Construction Methods

#### E10.6.1 General

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

#### E10.6.2 Temporary Formwork

##### (a) Construction Requirements

- (i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.
- (ii) 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.
- (iii) 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.
- (iv) 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.
- (v) 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 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.
- (d) 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.
- (e) 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.
- (f) 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.
- (g) 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.

#### E10.6.3 Concrete Construction Joints

- (a) After the forms are stripped off the construction joint, the entire face of the joint shall be thoroughly cleaned down to sound concrete and the surface roughened.
- (b) Refer to, E10.6.6, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

#### E10.6.4 Header and Abutment Roof Slab 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.

#### E10.6.5 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1-04, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
  - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.
  - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract



Administrator. The Contractor will be informed of this requirement 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 E10.1, "Requirements for Hardened Concrete", no retarders shall be used.
- (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-04 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.
- (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Owner upon request.

(d) Delivery of Concrete

- (i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

- (i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval.
- (ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E10.6.6 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 by water jet to remove latent cement and miscellaneous debris.
  - (ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. 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.

E10.6.7 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, 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<sup>2</sup>/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.
- (ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.
- (iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
- (iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
- (v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
- (vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (xi) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.

- (xii) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job site during all placing operations.
- (xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.
- (xiv) Before any concrete is placed for the header and abutment roof slabs, 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 slab thickness. 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.

#### E10.6.8 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 – Unformed Surfaces

- (i) All unformed concrete surfaces, shall be finished as outlined hereinafter.
- (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
- (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
- (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- (v) 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.

#### E10.6.9 General Curing Requirements

- (a) Refer to E10.6.10 for cold weather curing requirements and E10.6.11 of this Specification for hot weather curing requirements.
- (b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, a waterproofing membrane, or an asphalt overlay.
- (c) Freshly finished concrete shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.
- (d) 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.

- (e) 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.
- (f) 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.

E10.6.10 Cold Weather Concreting

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

E10.6.11 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.

(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 E10.2,

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

<b>TABLE E10.2: ACCEPTABLE CONCRETE TEMPERATURES</b>		
<b>THICKNESS OF SECTION, M</b>	<b>TEMPERATURES °C</b>	
	<b>MINIMUM</b>	<b>MAXIMUM</b>
Less than: 1	10	27

E10.6.12 Cleanup

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

E10.7 Concrete Quality

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

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.

E10.7.3 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 CSA Standard A23.1-04.
- (c) All testing of materials shall conform to CSA Standard A23.2-04.
- (d) All materials shall be submitted to the Contract Administrator for acceptance at least ten (10) 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.

E10.7.4 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 CSA Standard A23.1-04. An outline of the quality tests is indicated below.

#### E10.7.5 Concrete Testing

- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-04, "Slump of Concrete". If the measured slump falls outside the limits in E10.3.2 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-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E10.3.2 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 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 C 1202.
- (e) Testing for post-cracking residual strength index of FRC shall be tested as follows. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399 without the steel plate. The average of the peak loads is the cracking load of the concrete (P<sub>cr</sub>), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399. The average of the peak loads is the post cracking load of the concrete (P<sub>pcr</sub>). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Specimens shall be sampled in accordance with E10.7.5(g).
- (f) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-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-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (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 E10.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

#### E10.7.6 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.

#### E10.8 Measurement and Payment

##### E10.8.1 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) Structural Concrete:
    - ◆ Concrete Pavement for Abutment Roof Slabs
    - ◆ Concrete Pavement for Headers
- (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 "Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

#### E11. CONCRETE DECK SURFACE REPAIRS

##### E11.1 Description

- (a) This Specification shall cover all concrete repairs to the bridge deck surface as required.
- (b) The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things

necessary and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

#### E11.2 Scope of Work

- (a) The Work under this Specification shall involve the preparation and repair of concrete and reinforcing steel for:
  - (i) Type 1 Spall Repair
  - (ii) Type 2 Exposed Reinforcing Repair
  - (iii) Type 3 Corroded Reinforcing Repair

#### E11.3 Materials

##### E11.3.1 General

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

##### E11.3.2 Testing and Approval

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be accepted by the Contract Administrator at least five (5) 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 material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

##### E11.3.3 Concrete Repair Material

- (a) The Contractor shall be responsible for the design, performance, safe storage, and application of all concrete mixes supplied as per specification E11 "Structural Concrete".

##### E11.3.4 Material for Concrete Repair

- (a) Structural Concrete
  - (i) Structural Concrete shall be in accordance with specification E11 "Structural Concrete".
- (b) Epoxy Overlay System
  - (i) Approved Epoxy Overlay System shall be D-BASF Trafficguard EP35.
- (c) Galvashield XP Anodes
  - (i) Zinc anodes shall be Galvashield XP-Type available from Vector Corrosion Technologies, or equal as accepted by the Contract Administrator, in Accordance with B6, "Substitutes". Embedded galvanic anodes shall be pre-manufactured 60g of zinc in compliance with ASTM B6 Special High Grade cast around a pair of steel tie wires in compliance with bright annealed ASTM A82 and encased in a highly alkaline cementitious shell with a pH of 14 or greater. The cementitious shell shall contain no added sulphate nor shall it contain chloride, bromide or other constituents that are corrosive to reinforcing steel. Anode units shall be supplied with integral unspliced wires with loop ties for tying to the reinforcing steel.

##### E11.3.5 Curing

- (a) All cementitious patches shall be wet cured for 7 days unless otherwise approved by the Contract Administrator.



#### E11.3.6 Quality Control

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

#### E11.4 Equipment

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

#### E11.5 Construction Methods

##### E11.5.1 Debris and Cleanup

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

##### E11.5.2 Preparation

- (a) The Contract Administrator will mark out areas requiring concrete and reinforcing steel repair. The areas will be divided in to three repair types. Additional areas may be added as the Work proceeds.
- (b) The resulting surface from concrete removals is to be roughened as per specification E9 "Concrete Removal".
- (c) Limits of the repair areas are to be saw-cut 15 mm deep to provide a well-defined interface and bonding surface with the existing sound concrete.
- (d) All corroded steel shall be sand blasted to remove all corrosion to the Contract Administrators satisfaction
- (e) Type 1 Spall Repair
  - (i) Spalls shall be patched with the Epoxy Overlay System to the elevation of diamond ground surface in accordance with the manufacturer's instructions.
  - (ii) Surface shall be prepared as per manufacturers procedures including pre-prime with E-Bond 526.
  - (iii) All spalls with a depth greater than 5mm shall be patched in this fashion.
  - (iv) The Contract Administrator shall inspect all repaired areas for bond using a hammer "sounding" method following cure.
- (f) Type 2 Exposed Reinforcing Repair
  - (i) Exposed Reinforcing Repair shall occur at areas where the reinforcing is known or found to be within 15mm from the existing roadway surface. This repair may also apply in areas where additional concrete removals are required, up to a maximum depth of 30mm.
  - (ii) Saw cutting the perimeter of this repair area is not required as it may interfere with and damage the reinforcing steel.
  - (iii) If the reinforcing is found to be corroded then Type 3 Repair shall be followed as per E.11.5.2(g).
  - (iv) All epoxy coated reinforcing steel shall be touched up with approved epoxy coating.
  - (v) All exposed reinforcing shall be patched with the Epoxy Overlay System in accordance with the manufacturer's instructions.
  - (vi) The area of Epoxy Overlay System shall be defined by the required height of 10mm above the reinforcing steel and tapered flush at the edges in order to maintain positive drainage, greater than 1% slope.

- (vii) Surface shall be prepared as per manufacturers procedures including pre-prime with E-Bond 526.
- (viii) The Contract Administrator shall inspect all repaired areas for bond using a hammer “sounding” method following cure.
- (g) Type 3 Corroded Reinforcing Repair
  - (i) Concrete shall be removed from around and behind all corroding rebar in accordance with good concrete repair practice such as ACRA guideline HB84-2006. Section 6. Rebar shall be exposed to 30mm below the lower bars. Exposed reinforcing steel should be cleaned to remove all residual rust and concrete residue.
  - (ii) Install zinc anodes, wired to the reinforcing steel, in accordance with the Manufacturer’s instructions, around the perimeter of the patch area at a spacing of 600mm in locations as approved by the Contract Administrator.
  - (iii) The anode units and repair material should be installed immediately following preparation and cleaning of the steel reinforcement. Securely fasten the anode units from the side or beneath the exposed rebar as close as practical to the surrounding concrete (preferably within 100 mm) while ensuring that enough space remains to fully encapsulate the unit in the repair.
  - (iv) The minimum cover of the repair material over the galvanic anodes should be 20 mm. When required, the steel reinforcement, other than where the anodes are attached, should be primed immediately following attachment of the Galvashield XP with a 135 micron (wft) continuous coating of Nitoprime Zincrich. Over painting with the bonding agent or reinforcement primer, onto the surface of the Galvashield XP unit must be avoided.
  - (v) Anode-to-steel continuity and steel-to-steel continuity within the patch should be verified with an appropriate meter; discontinuous steel should be tied to continuous bars using steel tie wire and re-tested. A value between 0 and 1 ohm should be achieved.
  - (vi) All epoxy coated reinforcing steel shall be touched up with approved epoxy coating.
  - (vii) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates.
  - (viii) Repair areas shall be filled with Structural Concrete as per specification E10 “Structural Concrete” to elevation of diamond grinding or a height of 10mm above the existing reinforcing, whichever is greater.
    - ◆ Positive deck drainage, greater than 1% slope, must be maintained throughout the deck and all patched areas.
    - ◆ If the concrete patch is required to rise above the elevation of diamond grinding the edges of the new concrete shall taper down flush to the edges of the patch.
  - (ix) The Contract Administrator shall inspect all repaired areas for bond using a hammer “sounding” method following cure.

## E11.6 Measurement and Payment

### E11.6.1 Deck Repairs

- (a) The spall repairs on the deck surface will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Type 1 Spall Repair”, accepted and measured by the Contract Administrator.
- (b) The concrete repairs on the deck surface will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Type 2 Exposed Reinforcing Repair” and “Type 3 Corroded Reinforcing Repair”. The area to be paid for will be the total number of square metres of concrete deck surface repairs installed in accordance with the specification, classified as either “Type 2 Exposed Reinforcing

Repair”, or “Type 3 Corroded Reinforcing Repair”, accepted and measured by the Contract Administrator.

- (c) The supply and installation of galvanic anodes will be measured on a unit bases and paid for at the Contract Unit Price for each “Galvanic Anodes”, accepted and measured by the Contract Administrator.
- (d) 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 “Deck Repairs”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

## **E12. ELASTOMER WATERPROOFING MEMBRANE**

### **E12.1 Description**

- (a) This Specification shall cover all applications of elastomer waterproofing membrane as required.
- (b) The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

### **E12.2 Scope of Work**

- (a) Furnish labor, products, and equipment required for the application of a seamless spray elastomer waterproofing membrane to suitable concrete, masonry, or miscellaneous metal surfaces.
- (b) The coating system shall be spray applied, 100% solids, fast cure, high build polymer system. Primer is required.
- (c) The membrane system shall pass the ASTM C 1305 Crack Bridging Test. The ASTM C 1305 Crack Bridging Test shall be conducted on both the neat membrane and aggregated top coat.
  - (i) Base Membrane: The thickness to be tested shall be either 80 mils minimum, or the minimum thickness required to pass the crack bridging test, whichever is thicker. The thickness required to pass the test shall be the minimum thickness required for all field application of the base membrane.
  - (ii) Composite Base Membrane and Aggregated Top Coat: In addition to the base membrane, the complete composite system (base membrane plus aggregated top coat) shall be subjected to the ASTM C 1305 Crack Bridging Test. The minimum thickness determined in part E12.2(c)(i) shall be the thickness of the base membrane in the composite system. The top coat material shall be 40 mils with aggregate broadcast at a rate of 0.33-0.50 lbs. per ft<sup>2</sup> to achieve a minimum 95% coverage rate.
- (d) Primer shall be applied at 130-200 ft<sup>2</sup> per gallon, or at the rate specified by the manufacturer.
- (e) Base membrane shall be applied at 80 mils minimum (20 ft<sup>2</sup> per gallon), or the thickness used to pass the ASTM C 1305 Crack Bridging Test (see part E12.2(c) for additional information).
- (f) Apply aggregate broadcast into top coat membrane applied at 40 mils.
- (g) Broadcast aggregate applied at 0.33-0.50 lbs. per ft<sup>2</sup> to achieve a minimum 95% coverage rate.
- (h) Base membrane and aggregated top coat shall be capable of accepting emergency and temporary vehicular traffic at highway speeds (≥65 MPH) one (1) hour after application. Membrane shall maintain a non-skid, aggregated surface without significant aggregate loss throughout the duration of traffic exposure.

- (i) Wick drains shall be installed along the perimeter of the asphaltic pavement area next to each barrier and headers. Vertical drain pipes shall be installed at the four corners of the asphaltic pavement area next to headers.
- (j) Rubber membrane shall be installed along the vertical face of the precast barrier and extend under and past the wick drain by 50mm.
- (k) An asphalt wear course shall be applied over hot applied tack coat, supplied by asphalt contractor. Apply tack coat in accordance with tack coat manufacturer's recommendations.

#### E12.3 Definitions

- (a) Concrete Surface Preparation – SSPC-SP13/NACE No. 6.

#### E12.4 Submittals

- (a) Manufacturer shall provide independent laboratory test results from an AASHTO-accredited laboratory illustrating each component's conformance to the physical property requirements listed in Tables 2 and 3. All testing shall be current (conducted within the past three (3) years).
- (b) The manufacturer's material safety data sheets (MSDS) for each of the components.
- (c) The manufacturer's current product data sheets. Provide all primers and membranes from the same manufacturer.
- (d) The manufacturer's current installation and testing procedure document. This document shall conform in its entirety with all the requirements specified herein.
- (e) Two sample coupons (4"x4") that are representative of the finished membrane surface, texture, and color. Approved samples will serve as a basis for acceptance of the work for the duration of the product.
- (f) Service record showing that the membrane has a satisfactory record of not less than five (5) years, prior to the date of submission, for similar applications with names of specific structures and owner contact information.
- (g) List of projects similar in nature and complexity completed in the last five (5) years.

#### E12.5 Project Conditions

- (a) Environmental Requirements
  - (i) Install system when air and substrate temperature is above -20°F and substrate temperature is 5°F above the dew point and rising.
  - (ii) Install system once substrate moisture content is below 5.0%. Test concrete moisture content with a non-destructive concrete moisture meter, such as Tramex.
- (b) Personal Requirements
  - (i) Provide protective clothing, gloves, and respirators for use by installers as required.

#### E12.6 Quality Assurance

- (a) Manufacturer Qualifications: Use ISO 9001 certified manufacturer with a minimum of five (5) years experience providing the principal materials for work in this section. The manufacturer should be a primary blender with proprietary formulations, an Authorized Applicator program, and capacity to provide field technical services as required. Provide all primers and membranes from the same manufacturer. Provide a list of specific projects previously completed which have utilized the principal materials specified in this section.
- (b) Manufacturer's On-Site Representative: Manufacturer shall provide an authorized representative to be on the job site at all times to observe the installation of each portion of the membrane system. The manufacturer's representative, upon consultation with the Contract Administrator, may suspend any item of work that is suspect and does not meet the requirements of this specification. Resumption of work will occur only after the manufacturer's representative and the Contract Administrator are satisfied that appropriate remedial action has been taken by the contractor.

- (c) Contractor Qualifications: Contractor applying the waterproofing system shall be authorized to apply the system by the manufacturer. This authorization shall apply to the individuals installing the materials. Manufacturer authorized applicators shall be re-certified yearly. The contractor shall be an established firm regularly engaged in satisfactory installations of similar materials on projects similar in nature and complexity. Provide a list of specific projects contractor has previously completed.
- (d) Schedule pre-installation conference to review installation schedule, shut down, and restricted access procedures. Indicate Contractor's superintendent.
- (e) Inspect surface preparation, application procedures, and review proposed dry film thickness at each installation location.

E12.7 Delivery, Storage, and Handling

- (a) Deliver product in manufacturer's original containers.
- (b) Store product in warm, dry condition in accordance with manufacturer's product data sheets.
- (c) Replace product damaged by shipment, weather, or job conditions.

E12.8 Manufacturer:

Bridge Preservation LLC.  
 686 South Adams Street  
 Kansas City, KS 66105  
 (913) 321-9000

E12.9 Materials

- (a) Primer: Bridge Deck Concrete Primer - Two-component polymer primer with the material properties shown in Table 1.

**Table 1: Multi-Component Polymer Primer**

Physical Property	Test Method	Value
Gel Time		>5 minutes
Tack Free Time, max @ 77°F		<2.5 hours
Mixing Ratio		Per Manufacturer
Adhesion to Concrete	ASTM D 4541	>150 psi

- (b) Spray Applied Waterproofing Membrane (Base Coat): Bridge Deck Membrane - 100% solids, rapid curing elastomer with the material properties shown in Table 2.

**Table 2: Spray Applied Waterproofing Membrane**

Physical Property	Test Method	Value
Solids Content		100%
Gel Time		<10 seconds
Cure Time		<30 seconds
Tack Free Time		<30 minutes
Shore Hardness	ASTM D 2240	>40D
Water Vapor Transmission	ASTM E 96 (Procedure B)	0.94 perms
Adhesion to Concrete	ASTM D 4541	>150 psi
Tensile Strength	ASTM D 638	>2,000 psi

Tear Strength (pli; Die C)	ASTM D 638	>350 pli
Elongation at Break	ASTM D 638	>150%
Crack Bridging Ability (80 mils Neat - 1/8" opening @ -15°F, 40 cycles)	ASTM C 1305	Pass @ 40 cycles
Crack Bridging Ability (80 mils Neat + 40 mils with Aggregate - 1/8" opening @ -15°F, 40 cycles)	ASTM C 1305	Pass @ 40 cycles

- (c) Spray Applied Aggregate Membrane (Top Coat): Bridge Deck Membrane - 100% solids, rapid curing elastomer with the material properties shown in Table 3.

**Table 3: Spray Applied Aggregated Membrane (Top Coat)**

Physical Property	Test Method	Value
Solids Content		100%
Gel Time		>30 seconds
Tack Free Time		>5 minutes
Open to Traffic		1 hour
Shore Hardness	ASTM D 2240	>40D
Tensile Strength	ASTM D 638	>2,000 psi
Tear Strength (pli; Die C)	ASTM D 638	>350 pli
Elongation at Break	ASTM D 638	>150%
Crack Bridging Ability (80 mils Neat + 40 mils with Aggregate - 1/8" opening @ -15°F, 40 cycles)	ASTM C 1305	Pass @ 40 cycles

- (d) Broadcast Aggregate: Furnish broadcast aggregate as recommended by the manufacturer.
- (e) Tack Coat: Furnish tack coat recommended by the waterproofing manufacturer. The waterproofing manufacturer shall provide test results from an AASHTO-accredited laboratory illustrating that the proposed tack coat provides adequate shear and tensile adhesion between the waterproofing membrane and asphalt overlay.
- (f) Rubber membrane shall be 1.2mm thick, installed as per the Manufacturer's instructions. Rubber membrane adhesive shall be in accordance with Elastomeric Waterproofing Contractors recommendations.
- (g) Wick Drain: Wick drain shall consist of composite polypropylene with a total thickness of 3.6mm supplied in 100mm widths. The puncture strength shall be a minimum of 45N measured in accordance with ASTM D4833. An approved product is AMERDRAIN 407. Down spouts shall be fabricated of PVC pipe.

E12.10 Construction Methods

E12.10.1 Inspection

- (a) Prior to application of primer, inspect and approve substrate preparation.

E12.10.2 Preparation

- (a) Provide clean, sound concrete substrate.

- (b) Prepare concrete surfaces to SSPC-SP13/NACE No. 6 Surface Preparation of Concrete.
- (c) Test prepared concrete surface using Elcometer adhesion testing (ASTM D 4541). Minimum pull strength is 150 psi or failure in the concrete.
- (d) Mask protected surfaces prior to spray applications.
- (e) Erect spray curtains and partitions as required.

#### E12.10.3 Waterproofing Installation

- (a) Do not begin membrane installation until all materials and equipment necessary to perform the installation and all required repairs are at the job site.
- (b) Contractor shall maintain spray and other installation equipment in proper operating condition throughout installation. Provide reserve equipment as required.
- (c) Manufacturer's on-site representative shall perform and record relevant field quality control readings throughout the installation process. See E12.10.5 Field Quality Control for complete requirements.
- (d) Spray, squeegee, or roll primer at 130-200 ft<sup>2</sup> per gallon over surfaces to receive spray applied waterproofing membrane. Allow primer to go tack free before spraying waterproofing membrane.
- (e) Spray waterproofing membrane over primed surfaces at a minimum thickness of 80 mils (20 ft<sup>2</sup> per gallon) or the minimum thickness required to pass the ASTM C 1305 Crack Bridging Test (see E12.2). Spray additional base coats as required to achieve the specified thickness.
- (f) Spray top coat membrane over base membrane at a thickness of 30-40 mils and immediately broadcast aggregate at 0.33-0.50 lbs. per ft<sup>2</sup> to achieve a minimum coverage rate of 95%.
- (g) Place a hot tack coat recommended for use by the waterproofing membrane manufacturer and asphalt wear course. Tack coat shall be supplied by the asphalt contractor and shall be installed in accordance with the tack coat manufacturer's recommendations.

#### E12.10.4 Rubber Membrane Installation

- (a) Rubber membrane shall be installed continuously along the length of the precast barrier in the lower bridge gutter only. The membrane shall extend from the top of the proposed asphaltic pavement to a horizontal distance of 50mm past the wick drain.
- (b) Rubber membrane shall be adhered to the elastomeric waterproofing membrane. The wick drain will subsequently be adhered to the rubber membrane.
- (c) All chamfered joints between precast barriers shall be filled flush to the vertical face of barriers using an approved Epoxy Grout. The epoxy grout shall be formed or hand troweled in place as per the manufactures instructions. The epoxy grout shall be applied after the elastomeric waterproofing membrane has been installed and cured.
- (d) Rubber membrane shall be installed as per the manufacturer's instructions once the epoxy grout has cured.
- (e) Special attention shall be given to modifications at the drain pipe locations. A clean hole is to be cut at locations of drain pipes with a diameter 5mm less than the internal diameter of the drain pipe.
- (f) Proper adhesion shall be verified by the Contract Administrator at locations of the drain pipes.
- (g) All seams in membrane shall overlap a minimum distance of 300mm. Seam overlap shall be installed in a manner than prevents water ingress.

#### E12.10.5 Wick Drain Installation

- (a) Wick drains shall be installed along the full length of the barriers and headers, and shall be installed when the asphalt tack coat is still hot and tacky. Special attention shall be given to waterproofing and wick drain modifications at drain pipe locations.
- (b) Wick drain pipe shall be cored through the existing concrete deck and hollow box girder to gain access through the bottom of the girder. Reinforcing steel to be located using pachometer. Reinforcing shall not be damaged during coring process.
- (c) Access to within the girders will be provided by the City. The Contractor shall submit a request to the Contract Administrator at least five (5) Business Days prior to the commencement of any scheduled work within the Bridge girders.
- (d) 50mm diameter PVC wick drain pipes shall be installed flush with the top of concrete surface after concrete diamond grinding and before waterproofing.
- (e) A coupler shall be fitted to the top of the pipe. The pipe shall then be grouted in place with an approved Epoxy Grout as per specification E10 "Structural Concrete". Grout shall be installed throughout the full cored height to provide a complete seal around the pipe.
- (f) Cut open 300mm of wick drain filter wrap at ends and trim the plastic insert portion flush with the inside wall of the drain pipe. Fold and insert the remaining filter wrap into PVC pipe.
- (g) Wick drain down spouts shall be installed in each corner of the bridge at the lowest elevations where positive drainage is maintained.

#### E12.10.6 Field Quality Control

- (a) All work in this section to be completed by waterproofing manufacturer's on-site representative. Representative shall record all readings and test results into a "Quality Control Daily Log". A copy of each daily log shall be submitted to the Engineer at the end of each day.
- (b) Record environmental conditions readings at least once every four hours, when ambient conditions significantly change, or immediately prior to contractor performing new task (prior to installing primer, prior to installing base membrane, etc.), whichever is more frequent.
- (c) Record material batch numbers, processing information, and quantity of each material used.
- (d) Perform tensile adhesion bond testing of both primer and base membrane in accordance with ASTM D 4541. On metal surfaces, the minimum adhesion value is 300 psi.
- (e) Perform dry film thickness testing of base membrane in accordance with SSPC-PA2 or SSPC-PA9 Measurement of Dry Coating Thickness. Destructive or stroke per gallon methods are also suitable methods of thickness assurance on most projects.
  - (i) If on-site representative uses magnetic test equipment, testing shall be performed in accordance with SSPC-PA2 Measurement of Dry Coating Thickness with Magnetic Gages.
  - (ii) If on-site representative uses ultrasonic test equipment, testing shall be performed in accordance with SSPC-PA9 Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages.
  - (iii) Ultrasonic testing is usually accurate to +/- 5%.
  - (iv) Spray equipment is calibrated and tested to a stroke count per gallon of material sprayed.
  - (v) Repair destructive areas by respraying or filling with special two component gun grade material provided by the waterproofing manufacturer.
  - (vi) Other components of system may be tested for thickness using wet film or stroke per gallon methods.
- (f) Perform visual inspections throughout installation process. Holidays or other defects in the waterproofing membrane shall be marked and repaired.



E12.10.7 Manufacturer Quality Control

- (a) Contractor shall spray two 12"x12" samples of base membrane and top membrane, once at the beginning of the day and once at the end of the day. This shall be done each day that the waterproofing membrane is installed. On-site representative shall record time and date, product batch numbers, and equipment processing settings. Samples shall be sent to local third party laboratory for physical property testing. The physical properties of field samples shall be in accordance with the tensile, tear, and elongation material properties listed in the corresponding product data sheets.
- (b) Manufacturer shall provide Physical Properties Report to Contract Administrator upon completion.
- (c) Manufacturer shall provide Certificates of Analysis (COA) and IR Spectroscopy scans of all materials used. COA and IR Scan documents shall clearly list batch numbers. Each component's batch number listed in these documents shall match the batch numbers of the material on the job site, as well as the batch numbers recorded in the Quality Control Daily Logs. Additionally, the batch numbers listed on each 12"x12" field sample shall match the aforementioned documents. COAs shall illustrate that each batch of liquid material conforms to the manufacturer's specified standards.

E12.10.8 Cleaning

- (a) Clean spills and oversprays as they occur.
- (b) Consult manufacturer's literature and MSDS for proper cleaning products and methods.
- (c) Clean site to Contract Administrator's satisfaction prior to final acceptance.

E12.10.9 Protection

- (a) Protect installed work prior to acceptance by owner.

E12.10.10 Schedules

- (a) Submit spray schedule five (5) days before commencement of any Work.

E12.11 Measurement and Payment

E12.11.1 Installation of Wick Drain, Drain Pipes, Barrier Joint Grouting and Rubber Membrane

- (a) The supply and installation of wick drains, drain pipes, grouting precast barrier chamfer joints and rubber membrane are considered incidental to "Elastomer Waterproofing Membrane" and no separate payment will be paid for the Work.

E12.11.2 Elastomer Waterproofing Membrane

- (a) The supply and application of the Elastomer Waterproofing Membrane will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Elastomer Waterproofing Membrane." The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.

**E13. CONSTRUCTION OF ASPHALTIC CONCRETE PAVEMENTS**

E13.1 Description

- (a) This Specification shall cover all construction of asphaltic concrete pavements as required.
- (b) The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E13.2 Scope of Work

- E13.3 Further to CW 3410-R10, the Contractor shall apply two separate 40mm lifts of asphalt in accordance with the joint pattern specified herein.
- E13.4 General:
- (a) Remove surplus material from surface of previously laid strip.
  - (b) Do not deposit on surface of freshly laid strip.
  - (c) Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
- E13.5 Transverse joints:
- (a) Offset transverse joint in succeeding lifts by at least 600 mm.
  - (b) Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
  - (c) Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- E13.6 Longitudinal joints:
- (a) Offset longitudinal joints in succeeding lifts by at least 150 mm.
  - (b) Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
  - (c) If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane. Sawcut shall not damage waterproofing membrane.
  - (d) Overlap previously laid strip with spreader by 25 to 50 mm.
  - (e) Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
  - (f) Roll longitudinal joints directly behind paving operation.
  - (g) When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.