



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 217-2005**

**MAIN AND NORWOOD SOUTHBOUND BRIDGES DECK SEALING AND RELATED  
WORKS**

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## **PART B - BIDDING PROCEDURES**

### **B1. PROJECT TITLE**

B1.1 MAIN AND NORWOOD SOUTHBOUND BRIDGES DECK SEALING AND RELATED WORKS

### **B2. SUBMISSION DEADLINE**

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 31, 2005.

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

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

### **B3. SITE INVESTIGATION**

B3.1 Further to GC:3.1, the Bidder may view the Site without making an appointment.

B3.2 The Bidder shall not be entitled to rely on any information or interpretation received at the Site Investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B3.3 The Bidder is advised that the information hereinafter is available for viewing (and copies will be made available at the cost upon request) at the office of the Contract Administrator.

(a) All available record Drawings of the existing bridges.

B3.4 No claims shall be made by the Bidder, after the Tender Submission is made or the Work is done, that there was a misunderstanding as to his responsibility in securing for himself information relative to the nature and scope of Work to be done.

### **B4. ENQUIRIES**

B4.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

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

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

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

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

## **B5. ADDENDA**

- B5.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.
- B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda shortly before submitting his Bid.
- 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 seven (7) Business Days prior to the Submission Deadline.
- B6.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
  - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
  - (c) identify any anticipated cost or time savings that may be associated with the substitute;
  - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed Work Schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
  - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed Work Schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.

- B6.6 The Contract Administrator will provide a response in writing, at least three (3) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.
- B6.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.
- B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative shall base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B15.
- B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

## **B7. BID SUBMISSION**

- B7.1 The Bid Submission consists of the following components:
- (a) Form A: Bid;
  - (b) Form B: Prices;
  - (c) 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 All components of the Bid Submission 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 in ink, to constitute a responsive Bid.
- B7.3 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.3.1 Samples or other components of the Bid Submission 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 Submission.
- B7.4 Bid Submissions submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.5 Bid Submissions shall be submitted to:
- The City of Winnipeg  
Corporate Finance Department  
Materials Management Branch  
185 King Street, Main Floor  
Winnipeg MB R3B 1J1

## **B8. BID**

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
- (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
- (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
- (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

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

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

B8.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:

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

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

B8.4.2 All signatures shall be original and shall be witnessed except where a corporate seal has been affixed.

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 Submission 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.

## **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;

- (b) be responsible and not be suspended, debarred or in default of any obligation to the City;
- (c) be financially capable of carrying out the terms of the Contract;
- (d) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract;
- (e) have successfully carried out work, similar in nature, scope and value to the Work;
- (f) employ only Subcontractors who:
  - (i) are responsible and not suspended, debarred or in default of any obligation 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 Branch internet site at <http://www.winnipeg.ca/matmgt>); and
  - (ii) have successfully carried out work similar in nature, scope and value to the portion of the Work proposed to be subcontracted to them, and are fully capable of performing the Work required to be done in accordance with the terms of the Contract;
- (g) have a written workplace safety and health program in accordance with The Workplace Safety and Health Act (Manitoba);
- (h) such other pertinent data as may be required by the Contract Administrator; and
- (i) be a Manufacturer's Certified Applicator of the non-skid polymer wearing surface system.

B10.2 Further to B10.1(g), the Bidder shall, within three (3) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

- (a) a valid COR certification number under the Certificate of Recognition (COR) Program - Option 1 administered by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
- (b) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association; 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 Branch internet site at <http://www.winnipeg.ca/matmgt>.)

B10.3 The Bidder shall be prepared to 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.

B10.4 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.
- B11.2 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 Bid Submissions will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Branch, or in such other office as may be designated by the Manager of Materials.
  - B12.1.1 Bidders or their representatives may attend.
  - B12.1.2 Bid Submissions determined by the Manager of Materials, or his designate, to not include the bid security specified in B11 will not be read out.
- B12.2 After the public opening, the names of the Bidders and their Total Bid Prices as read out (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 Branch internet site at <http://www.winnipeg.ca/matmgt>.
- 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 Branch internet site at <http://www.winnipeg.ca/matmgt>.
- B12.4 The Bidder is advised that any information contained in any Bid Submission may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

## **B13. IRREVOCABLE BID**

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

B13.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

#### **B14. WITHDRAWAL OF BIDS**

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

B14.1.1 Notwithstanding GC:23.3, 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 shall:

- (a) retain the Bid Submission until after the Submission Deadline has elapsed;
- (b) open the Bid Submission to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
- (c) if the notice has been given by any one of the persons specified in B14.1.3(b), declare the Bid withdrawn.

B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

#### **B15. EVALUATION OF BIDS**

B15.1 Award of the Contract shall be based on the following bid evaluation criteria:

- (a) compliance by the Bidder with the requirements of the Bid Opportunity (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 Submission 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 if the interests of the City so require.

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

B15.4 Further to B15.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.

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

**B16. AWARD OF CONTRACT**

B16.1 The City will give notice of the award of the Contract by way of a letter of intent, 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.

B16.4 The City intends to award this Contract by June 17, 2005.

## **PART C - GENERAL CONDITIONS**

### **C1. GENERAL CONDITIONS**

C1.1 The *General Conditions for Construction Contracts* (Revision 2000 11 09) are applicable to the Work of the Contract.

C1.1.1 The *General Conditions for Construction Contracts* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

## **PART D - SUPPLEMENTAL CONDITIONS**

### **GENERAL**

#### **D1. GENERAL CONDITIONS**

- D1.1 In addition to the *General Conditions for Construction Contracts*, these Supplemental Conditions are applicable to the Work of the Contract.
- D1.2 The General Conditions are amended by striking out "The City of Winnipeg Act" wherever it appears in the General Conditions and substituting "The City of Winnipeg Charter".
- D1.3 The General Conditions are amended by striking out "Tender Package" wherever it appears in the General Conditions and substituting "Bid Opportunity".
- D1.4 The General Conditions are amended by striking out "Tender Submission" wherever it appears in the General Conditions and substituting "Bid Submission".
- D1.5 The General Conditions are amended by deleting GC:6.16 and GC:6.17. The City of Winnipeg is now within the jurisdiction of the Manitoba Ombudsman pursuant to The Ombudsman Act.

#### **D2. SCOPE OF WORK**

- D2.1 The Work to be done on the Main and Norwood Southbound Bridges under the Contract shall consist of all operations relating to the application of a non-skid polymer wearing surface and miscellaneous concrete repair works.
- D2.2 The major components of the Work are as follows:
- (a) Traffic Control
  - (b) Concrete Deck Surface Preparation Work
  - (c) Application of Non-Skid Polymer Wearing Surface
  - (d) Concrete Repairs at the North Abutment of the Norwood Southbound Bridge

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

- D3.1 The Contract Administrator is Earth Tech (Canada) Inc., represented by:  
Mr. James Betke, P. Eng.  
Bridge Design and Projects Engineer  
850 Pembina Highway, Winnipeg, Manitoba R3M 2M7  
Telephone No. (204) 478-8559  
Facsimile No. (204) 478-7856
- D3.2 At the pre-construction meeting, Contract Administrator will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

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

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

## **D5. NOTICES**

- D5.1 Except as provided for in GC:23.2.2, 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.
- D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3, D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.
- D5.3 All notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:
- The City of Winnipeg  
Chief Administrative Officer Secretariat  
Administration Building, 3rd Floor  
510 Main Street  
Winnipeg MB R3B 1B9  
Facsimile No.: (204) 949-1174
- D5.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:
- The City of Winnipeg  
Corporate Services Department  
Legal Services Division  
185 King Street, 3rd Floor  
Winnipeg MB R3B 1J1  
Facsimile No.: (204) 947-9155

## **D6. FURNISHING OF DOCUMENTS**

- D6.1 Upon award of the Contract, the Contractor will be provided with three (3) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

## **SUBMISSIONS**

### **D7. INSURANCE**

- D7.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) all inclusive, with The City of Winnipeg being added as an additional insured, with a cross-liability clause, such liability policy to also contain a contractual liability, an unlicensed motor vehicle liability and a products and completed operations endorsement to remain in place at all times during the performance of the Work and throughout the warranty period;
  - (b) automobile liability insurance for owned and non-owned automobiles used for or in connection with the Work in the amount of at least two million dollars (\$2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;

- D7.2 Deductibles shall be borne by the Contractor.
- D7.3 The Contractor shall provide the City Solicitor with a certified true copy or a certificate of insurance of each policy, in a form satisfactory to the City Solicitor, 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 GC:4.1 for the return of the executed Contract.
- D7.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator.

## **D8. PERFORMANCE SECURITY**

- D8.1 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.
- D8.1.1 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.
- D8.2 If the bid security provided in his Bid Submission was not a certified cheque or draft pursuant to B11.1(c), 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 GC:4.1 for the return of the executed Contract.

## **SCHEDULE OF WORK**

### **D9. COMMENCEMENT**

- D9.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D9.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
    - (i) evidence that the Contractor is 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;
    - (ii) evidence of the workers compensation coverage specified in GC:6.14;
    - (iii) evidence of the insurance specified in D7;
    - (iv) the performance security specified in D8;
  - (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.

D9.3 The Contractor shall not commence the Work on the Site before July 1, 2005.

**D10. WORKING DAYS**

D10.1 The Contract Schedule is not based on Working Days.

**D11. WORK SCHEDULE**

D11.1 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 Site.

D11.2 The Contractor shall ensure that the proposed time frames are consistent with the requirements to:

- (a) commence the Work as specified in D9;
- (b) achieve Substantial Performance as specified in D12; and
- (c) achieve Total Performance as specified in D13.

D11.3 The Contractor shall work a minimum twelve (12) hour Working Day when the weather conditions are favourable for undertaking this Work unless specific activities being undertaken in a manner acceptable to the Contract Administrator do not allow this to be possible.

**D12. SUBSTANTIAL PERFORMANCE**

D12.1 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.

D12.2 The Contractor shall achieve Substantial Performance by August 31, 2005.

D12.3 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D12.4 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.

**D13. TOTAL PERFORMANCE**

D13.1 The Contractor shall achieve Total Performance by September 15, 2005.

D13.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D13.3 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.

#### **D14. LIQUIDATED DAMAGES**

- D14.1 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 five hundred dollars (\$500) per Calendar Day for each and every Calendar Day following the day fixed herein for Substantial Performance during which such failure continues.
- D14.2 The amount specified for liquidated damages in D14.1 is based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.
- D14.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

#### **CONTROL OF WORK**

##### **D15. JOB MEETINGS**

- D15.1 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.
- D15.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

##### **D16. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)**

- D16.1 Further to GC:6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

##### **D17. TEMPORARY STRUCTURES**

- D17.1 The location of all Contractor's temporary structures shall be subject to the approval of the Contract Administrator. Temporary structures erected by the Contractor shall remain his property and shall be removed from the site immediately upon completion of the Work or as directed by the Contract Administrator.

##### **D18. TRAFFIC CONTROL**

- D18.1 Further to Standard Provisions CW 1130-R1 of the City of Winnipeg, Works and Operations, Standards Construction Specifications, the Contractor shall be responsible for traffic control and maintenance of access within the specified Contract limits indicated on the Construction Drawings as per the following requirements:
- (a) Only one lane may be closed at a time. Only continuous lanes and not portions of lanes will be permitted to be closed. There shall be no disruption of traffic entering or leaving intersecting streets or approaches unless otherwise approved by the Contract Administrator.
  - (b) The Contractor shall not disrupt pedestrian traffic on the bridges for the duration of the Contract.

- D18.2 The Contractor shall provide the Contract Administrator with a formal Traffic Control Plan for review and acceptance at least two (2) Business Days prior to the commencement of any work on Site.
- D18.3 The use of traffic signs having wheel rim bases will not be permitted. The Contractor shall utilize traffic signs with a 24" x 24" flat plate base with the corners turned or angled downwards 1". The signage shall be ballasted with sand bags to prevent overturning under wind pressures of 100 km/h wind velocities. The Contractor is responsible for monitoring and maintaining all traffic signage 24 hours per day.

## MEASUREMENT AND PAYMENT

### D19. PAYMENT SCHEDULE

- D19.1 Further to GC:12.7, 12.8, 12.9 and 12.10, the City shall only be required to pay the Contractor for the material and equipment required for the Work upon the installation and total incorporation of the same permanently in the Work.

## WARRANTY

### D20. WARRANTY

- D20.1 Notwithstanding GC:13.2, the warranty period shall begin on the date of Total Performance and shall expire five (5) years thereafter unless extended pursuant to GC:13.2.1 or GC:13.2.2, in which case it shall expire when provided for thereunder.
- D20.2 Maintain the Work
- D20.2.1 Further to GC: 13.2 of the General Conditions, the Contractor shall, at his sole cost and expense, maintain the Work against any and all defects of deficiencies or otherwise, which may arise for a Warranty Period of Five (5) years from the date of the Certificate of Total Performance.
- D20.2.2 Furthermore, the Contractor shall correct, at his sole cost and expense, all seasonal or other pre-warranty identified deficiencies, in accordance with the Contract documents during the Warranty period.
- D20.3 Final Acceptance of the Work
- D20.3.1 At least two (2) weeks prior to the expiration of the Warranty Period, or upon correction of all outstanding defects and deficiencies, whichever is the later, the Contractor shall request of the Contract Administrator a joint acceptance inspection of the Work. The Contract Administrator will, on being satisfied that all outstanding defects and deficiencies of the Contract have been corrected, issue a Certificate of Acceptance of the Work to be dated not earlier than five (5) years after the date of the Certificate of Total Performance, or the date that the Contractor corrects the final defects and deficiencies, whichever is the later, thereby terminating the Warranty Period. The Certificate of Acceptance will, subject to GC: 13.9, 13.10 and 13.11, indicate acceptance of the due performance of the Contract.
- D20.4 Extension of Warranty Period
- D20.4.1 Further to GC: 13.9, 13.10 and 13.11, in the event that all outstanding defects and deficiencies have not been corrected to the satisfaction of the Contract Administrator at least one (1) week prior to the expiration of the warranty period, the Contractor shall be required to provide and maintain, at his sole cost and expense, an extension to the Performance Bond for a further one (1) year term with regard to those items of the Works

that have been identified by the Contract Administrator as still being defective and/or deficient. Failure to do so will necessitate the calling of the Performance Bond by the City.

D20.5 Additional Warranty

- D20.5.1 In addition to the preceding requirements, the Contractor (Supplier/Applicator) and the Manufacturer shall jointly warranty the Non-Skid Polymer Wearing Surface for a period of five (5) years.
- D20.5.2 The polymer resin manufacturer and the Contractor (Supplier/Applicator) shall jointly warranty the wearing surface against all defects in material and workmanship for a period of five (5) years. The non-skid polymer wearing surface shall provide a waterproof concrete bridge deck surface, and provide a smooth riding surface in accordance with E4.21. The warranty will not cover damage to the wearing surfaces caused by snow ploughs or track mounted vehicles. It will cover all debonding between layers of the wearing surface or debonding between the wearing surface and the deck, as well as cracking of the wearing surface.
- D20.5.3 The Contractor shall perform all warranty repairs within thirty (30) good-weather days after notification of defects by the City.
- D20.5.4 The Warranty Agreement (Form W2: Warranty Agreement) shall be signed by both the Manufacturer and the Contractor (Supplier/Applicator), acceptable to the City Solicitor.
- D20.5.5 The five (5) year warranty period shall commence on the date of issuance of the Certificate of Total Performance. The warranty shall cover all labour, equipment, materials, and traffic control required to satisfactorily repair or replace the wearing surface at no cost to the City. Warranty repairs shall be completed to the same Specifications as the original Work. Work that is not done in accordance with these Specifications will be rejected.
- D20.5.6 Until such time as the Warranty Agreement (Form W2) is submitted to the Contract Administrator, the Work of This Contract will be deemed incomplete and issuance of the Certificate of Total Performance and the final Progress Estimate will not be considered.

**FORM H1: PERFORMANCE BOND**  
(See D8)

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 dated the

\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, for:

BID OPPORTUNITY NO. 217-2005

MAIN AND NORWOOD SOUTHBOUND BRIDGES DECK SEALING AND RELATED WORKS

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

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

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

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

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

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

\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ .

SIGNED AND SEALED  
in the presence of:

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Name of Principal)

Per: \_\_\_\_\_ (Seal)

Per: \_\_\_\_\_

\_\_\_\_\_  
(Name of Surety)

By: \_\_\_\_\_ (Seal)  
(Attorney-in-Fact)

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT  
(PERFORMANCE SECURITY)**  
(See D8)

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

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 217-2005

MAIN AND NORWOOD SOUTHBOUND BRIDGES DECK SEALING AND RELATED WORKS

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

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

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

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

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

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

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

Partial drawings are permitted.

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

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

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

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

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

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

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

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

This credit is subject to the Uniform Customs and Practice for Documentary Credit (1993 Revision), International Chamber of Commerce Publication Number 500.

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

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

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

**FORM W2: WARRANTY AGREEMENT**  
(Page 1 of 2)

(See D20)

**Bridge Deck Surface Sealing Systems**  
**NON-SKID POLYMER WEARING SURFACE**

**FIVE YEAR WARRANTY TO THE CITY OF WINNIPEG**

**FOR PROJECT:**

**Main and Norwood Southbound Bridges  
Deck Sealing and Related Works  
Bid Opportunity No. 217-2005**

**Manufacturer's Name and Address**

**Supplier/Applicator's Name and Address**  
(approved Applicator in accordance with Contract Tender)

Do hereby jointly provide, in accordance with the Specifications of this Contract, a **Five (5) Year Warranty** for the herein identified Bridge Deck Surface Sealing System, as follows:

1. The Bridge Deck Surface Sealing System is warranted against all de-bonding between the Sealing System and the deck slab, between the Sealing System and the deck repair areas, and between the layers of the Sealing System; and
2. The Bridge Deck Surface Sealing System is warranted against cracking; and
3. The Bridge Deck Surface Sealing System is warranted to provide a waterproof seal for the bridge deck surface below; and
4. The Bridge Deck Surface Sealing System is warranted to provide a skid-resistant wearing surface equivalent to or better than the concrete deck surface it covers; and
5. The Bridge Deck Surface Sealing System is warranted to provide a smooth riding surface in accordance with E4.3.13 of the Specifications of this Contract;

all for a five (5) year period from the date of issue of the Certificate of Total Performance.

This Warranty provides for the replacement of defective areas of the Bridge Deck Surface Sealing System, at no cost to the City of Winnipeg, in the event that the Sealing System does not perform as herein warranted to the satisfaction of the City of Winnipeg.

(Continued on Page 2)

**FORM W2: WARRANTY AGREEMENT (Continued)**  
*(Page 2 of 2)*

**Bridge Deck Surface Sealing Systems**  
**NON-SKID POLYMER WEARING SURFACE**

**FIVE YEAR WARRANTY TO THE CITY OF WINNIPEG**

**FOR PROJECT:**

**Main and Norwood Southbound Bridges  
Deck Sealing and Related Works  
Bid Opportunity No. 217-2005**

**MANUFACTURER**

SIGNED, SEALED, AND DELIVERED  
in the presence of

_____	_____	_____
Name of Company Officer	Corporate Position	Signature of Company Officer

(Corporate Seal)

_____	_____	_____
Name of Witness	Signature of Witness	Date

**SUPPLIER/APPLICATOR**

SIGNED, SEALED, AND DELIVERED  
in the presence of

_____	_____	_____
Name of Company Officer	Corporate Position	Signature of Company Officer

(Corporate Seal)

_____	_____	_____
Name of Witness	Signature of Witness	Date

## PART E - SPECIFICATIONS

### GENERAL

#### E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

- E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.
- E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.2 The following Drawings are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
B103-05-01	Cover Sheet
B103-05-02	General Arrangement of Proposed Works Norwood Bridge Southbound
B103-05-03	Cross Section and Details Typical Non Skid Polymer Overlay
B104-05-01	General Arrangement and Details of Proposed Works Main Street Bridge Southbound

#### 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.
- E2.2 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. TRUCK WEIGHT LIMITS**

- E3.1 The City shall not pay for any portion of Material which results in the vehicle exceeding the maximum gross vehicle weight allowed under *The City of Winnipeg Traffic By-Law*, unless such vehicle is operating under special permit.

### **E4. NON-SKID POLYMER WEARING SURFACE**

#### **E4.1 Description**

- (a) This Specification shall cover the supply, deck repair, surface preparation including removal of areas of previously applied non-skid polymer wearing surfaces, and installation of a thin, flexible, multi-layered, bonded, non-skid polymer wearing surface onto designated concrete bridge deck surfaces.
- (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.

#### **E4.2 Materials**

##### **E4.2.1 General**

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

##### **E4.2.2 Testing and Approval**

- (a) Notwithstanding that the Contractor is responsible to provide all routine quality control testing for this Work, 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.

##### **E4.2.3 Handling and Storage of Materials**

- (a) All materials shall be handled and stored in a careful, safe, and workmanlike manner to the satisfaction of the Contract Administrator.
- (b) All materials especially the aggregates, shall be protected from all sources of moisture, dust, or other contaminants. All wet or otherwise contaminated materials will be subject to rejection at the discretion of the Contract Administrator.
- (c) The epoxy resin shall be stored in a secure, heated enclosure.

##### **E4.2.4 Polymers**

###### **E4.2.4.1 Epoxy Resin**

- (a) The epoxy resins shall be light coloured, one hundred percent (100%) solids, two (2) component flexible, thermosetting, moisture-insensitive material. It shall have high resistance to ultraviolet radiation, as well as excellent toughness, abrasion resistance, high bond strength, and waterproofing properties. The epoxy resin and epoxy mortar shall have the physical properties, as determined by a C.S.A. certified laboratory, shown in Table 1.
- (b) The following epoxy resins are approved products subject to receipt of satisfactory test data:
  - (i) Flexolith
  - (ii) Sternflex

- (iii) Thoroc EP 35
- (c) No other epoxy polymer will be considered acceptable to undertake this Work unless approved of by the City of Winnipeg Engineering Division following completion of a satisfactory field trial on an existing bridge deck in the City of Winnipeg.
- (d) Separate samples of the constituents from each batch of epoxy resin supplied for this Work shall be provided by the Contractor to the Contract Administrator for testing and approval at least ten (10) working days prior to the scheduled commencement of Work.
- (e) The epoxy resin and epoxy mortar shall meet the following physical properties or be otherwise accepted by the City of Winnipeg Engineering Division. (See Table 1: Physical Properties of Epoxy).

<b>TABLE 1 PHYSICAL PROPERTIES OF EPOXY</b>			
<b>Material</b>	<b>Physical Property</b>	<b>Required Value</b>	<b>Test Method</b>
Epoxy Resin	Bond strength to concrete @ 2 days	8.0 MPa (minimum)	ASTM C882-78
Epoxy Resin	Tensile strength @ 7 days	12.0 MPa (minimum)	ASTM D638-82A Speed 4-6 mm/min Sample type M-1 Use 6 x 10 mm sample
Epoxy Resin	Tensile elongation @ 7 days	30.0% (minimum)	ASTM D638-82A Speed 4-6 mm/min Use 6 x 10 mm sample
*Epoxy Mortar	compressive strength @ 7 days	45.0 MPa (minimum)	ASTM C109-86 50 x 50 mm cube specimens (See E:4.4.4)
Epoxy Resin	modulus of elasticity @ 7 days	700 MPa (maximum)	ASTM C109-86 50 x 50 mm cube specimens (See E4.4.4)
*Epoxy Mortar	Thermal compatibility @ 7 days	10 cycles of - 21°C to +60°C (minimum)	ASTM C884-78 6 mm depth
*Epoxy Mortar	Absorption volume of permeable void @ 7 days	1.25% (maximum)	ASTM C642-82 50 x 50 mm cubes oven dry @ 60°C for 48 hours
* <i>Epoxy Mortar test specimens shall consist of 1 part by volume of epoxy resin to 2.5 parts by volume of coarse aggregate.</i>			

**E4.2.4.2 Methyl Methacrylate (MMA) Degassa Degadur Resins**

- (a) The only approved MMA Polymer, subject to the receipt of satisfactory test data is Degassa Degadur Methyl Methacrylate Resin which shall conform to the manufacturer's data sheet entitled "Degadur, Methacrylate Resins for Protective Coatings, Revision 1990". No other MMA polymer will be considered acceptable to undertake this Work unless approved of by the City of Winnipeg Bridge Engineer

following completion of a satisfactory field trial on an existing Bridge deck in the City of Winnipeg.

- (b) The resins shall be amber, medium viscosity, one-hundred percent (100%) solids, two (2) component, thermoplastic materials. They shall have excellent resistance to ultraviolet radiation, as well as excellent toughness, abrasion resistance, bond strength, and waterproofing properties.
- (c) The primer DEGADUR B71, basecoat DEGADUR 330, and sealer resins DEGADUR 410, shall have the following physical properties at the age of seven (7) days or as otherwise noted in Table 2 (a) and Table 2 (b).

<b>TABLE 2 (a)</b>					
<b>PHYSICAL PROPERTIES OF DEGADUR RESINS</b>					
<b>Property</b>	<b>Units</b>	<b>Primer</b>	<b>Basecoat</b>	<b>Sealer</b>	<b>Test Method</b>
Density	g/cm <sup>3</sup>	1.05	1.01	0.98	--
Viscosity*	cps	220-330	1100-1300	450-550	ASTM D2393
Hardness	Shore D	83	56	61	ASTM D2240
Water Absorption	%	0.1	0.1	0.1	ASTM D570
Tensile Strength	MPa	29	8	9	ASTM D638
Elongation @ Break	%	3	300	140	ASTM D638
* <i>at time of mixing</i>					

**E4.2.4.3 Initiator**

- (a) The Initiator for the MMA resins shall be fifty percent (50%) Benzoyl Peroxide powder such as AKZO Chemicals, Inc. CADOX BFF-50 or an approved equivalent. Dosage rates shall be in accordance with the MMA overlay Manufacturer's recommendations issued in the Degadur Catalyst Design Table.

**E4.2.4.4 Promoter**

- (a) The Promoter, required for use with the MMA resins at application temperatures below 4°C, shall be N, N-Dimethyl-p-toluidine such as R.S.A. Corporation DMPT or an approved equivalent. Dosage rates shall be in accordance with the MMA overlay Manufacturer's recommendations.

**E4.2.4.5 Degadur Basecoat**

- (a) The basecoat shall have the following physical properties at the age of seven (7) days as noted in Table 2 (b).

<b>TABLE 2 (b) PHYSICAL PROPERTIES OF DEGADUR BASECOAT</b>			
<b>Property</b>	<b>Units</b>	<b>Required Value</b>	<b>Test Method</b>
Compressive Strength	MPa	17 - 21	ASTM C109
Tensile Strength	MPa	3 - 5	ASTM D638
Elongation @ Break	%	6	ASTM D638
Flexural Strength	MPa	9 - 10	ASTM C580 mod
Freeze/Thaw Resistance	–	Pass	ASTM C666
Bond Strength to Concrete	MPa	1.7 Minimum	ACI 503R
Coefficient of Thermal Expansion	10E-5/K	7.9	DIN
Vicat Temperature	°C	50	DIN

The tests listed in Tables 2 (a) and 2 (b) shall be conducted by a C.S.A. approved testing lab, and shall include infra-red spectro-analysis graphs of frequency vs. amplitude for each component. All tests, including the spectro-analysis, shall be done on the same samples of material.

E4.2.4.6 Methyl Methacrylate Mortar

- (a) Surface repair of the deck and curb shall be done with approved one hundred percent (100%) solids MMA mortar as described and supplied by the Manufacturer of the methacrylate polymer overlay. Installation shall be in strict accordance with the manufacturer's instructions

E4.2.5 Aggregate for Epoxy Resin Wearing Surface and Shallow Depth Deck Repair

- (a) The aggregate for the wearing surface and shallow depth deck repair shall be 3M Havelock Trap Rock, or approved equal, with the properties shown in Table 3 (a) and having sufficient field experience, to the satisfaction of the Contract Administrator, to show equivalent wear resistance. Only new, clean, dry aggregate meeting the gradation requirements shown in Table 3 (b) shall be used. The use of reclaimed aggregate from previous seeding operations will not be allowed.
- (b) These aggregates shall meet the following physical properties:

<b>TABLE 3 (a) AGGREGATE PROPERTIES</b>			
<b>Physical Properties</b>	<b>Units</b>	<b>Required Value</b>	<b>Test Method</b>
Compressive Strength	MPa	200 (minimum)	ASTM D2638-86
Water Absorption	%	0.75 (maximum)	ASTM C128-88
Sulfate Soundness (15 cycles)	%	0.75 (maximum)	ASTM C88-83
LA Abrasion Loss ASTM (on coarse aggregate sample)	%	12 (maximum)	ASTM C131-81

- (c) The aggregates for the wearing surface and for the shallow depth deck repair shall furthermore meet the following gradation requirements:

<b>TABLE 3 (b) GRADATION OF AGGREGATES</b>	
Coarse	
<b>Opening Size</b>	<b>Percent Passing</b>
4.76 mm	100%
3.36 mm	97 - 100%
2.38 mm	45 - 55%
2.00 mm	20 - 30%
1.19 mm	0 - 2%
Fine	
<b>Opening Size</b>	<b>Percent Passing</b>
2.38 mm	100%
2.00 mm	95 - 100%
1.19 mm	40 - 60%
0.841 mm	20 - 32%
0.595 mm	5 - 15%
0.420 mm	0 - 2%

E4.2.6 Aggregates for MMA Resin Wearing Surface

(a) Basecoat Filler Aggregate

- (i) For use in the basecoat application, materials shall consist of clean, dry (with less than 0.2% moisture), angular grained silica sand and shall be free from dirt, clay, asphalt, and other organic materials. Materials shall conform to the following sieve analysis:

<b>TABLE 4 (a) GRADATION OF BASECOAT FILLER AGGREGATES 0.045 mm Ground Silica Flour A minimum of 90% shall pass the 0.045 mm sieve</b>						
<b>Basaltic Sand</b>						
Sieve, mm	4.750	2.360	1.000	0.600	0.300	0.150
% Passing	99 - 100	92 - 100	16 - 70	45 - 65	10 - 20	0 - 10

(b) Basecoat Broadcast Aggregate

- (i) The basecoat broadcast aggregate shall conform to the requirements of Table 3 (b) except that the gradation of the seed aggregate shall meet requirements of Table 4 (b) below.

<b>TABLE 4 (b) BASECOAT BROADCAST AGGREGATE</b>				
Sieve, mm	4.750	3.350	2.000	0.850
% Passing	100	98 - 100	10 - 35	0 - 3

E4.3 Construction Methods

E4.3.1 Surface Preparation

- (a) The Contractor shall be aware of the presence of Xorex Steel Fibres within the concrete deck and shall undertake all measures necessary to ensure that the Xorex Steel Fibres will not interfere with the application and/or performance of the non-skid polymer wearing surface.

- (b) Immediately prior to commencing application of the non-skid polymer wearing surface, the concrete surface of the applicable deck slab or span, including the repair areas over which the wearing surface is to be applied, shall be thoroughly shot-blasted to remove all surface laitance, dirt, oil, grease, curing compound, existing membranes or protective coatings including previously applied non-skid polymer wearing surfaces, or other deleterious material. Surface preparation shall expose the fine aggregates and the coarse aggregate. The surface preparation shall produce a minimum surface profile of 3 mm on the substrate deck concrete.
- (c) Prior to shot blasting, the Contractor shall, in areas that a non-skid polymer wearing surface had been previously applied or is still present, remove the membrane by a mechanical means acceptable to the Contract Administrator. The Contractor shall satisfy himself and the Contract Administrator that should the removal of the existing membrane be incomplete, the extent to which it remains will not be detrimental to the performance of the wearing surface being applied in any way.
- (d) The prepared surface shall be free of all dirt, moisture, or other contaminants immediately prior to installation of the wearing surface. Reshot-blasting shall be required in the event of rain, delay in applying the wearing surface, or leakage of oil or other contaminants on the prepared surface. The face of the concrete shoulder traffic barriers shall also undergo this surface preparation to a height of 100 mm above the deck surface.
- (e) If the concrete shoulder barriers are treated with membranes or protective coverings, the limits of removal on the barrier shall first be sawcut to a 6 mm depth prior to removal by approved mechanical means. Membrane system to remain beyond the 100 mm polymer overlay upturn shall be fully protected during removal and sandblasting operations. All damages to these membranes which occur as a result of the Contractor's operations shall be repaired as directed by the Contract Administrator at the Contractor's expense. No material shall be placed without approval of the surface preparation by the Contract Administrator.
- (f) All existing caulking at the joint between the bridge deck and traffic barriers shall be removed prior to sandblasting. All joint reveals shall be thoroughly cleaned to the satisfaction of the Contract Administrator and be fully filled with epoxy mortar prior to the application of the non-skid polymer wearing surface. This Work is considered incidental to the application of flexible epoxy wearing surface and no extra payment will be considered.
- (g) Only the area inaccessible for shot-blasting, including the 100 mm vertical face of the concrete shoulder barriers, shall be prepared by very heavy sandblasting to remove all laitance and to expose the coarse aggregate in the substrate concrete to a minimum surface profile of 3 mm.
- (h) The acceptability of the surface preparation will be determined by a vertical axis pull bond test. This test involves the bonding of a 64 mm diameter sandblasted steel disk to the prepared substrate, using a fast-setting epoxy, and its removal from the substrate by applying a vertical pull.
- (i) Substrate preparation will be approved if at least seventy-five percent (75%) of the bonded steel disk surface is covered with substrate concrete exceeding 3 mm in depth. The frequency of this test is at the discretion of the Contract Administrator, but initially one (1) test will be done for approximately each one hundred (100 m<sup>2</sup>) square metres.

#### E4.3.2 Polymer Application Coverage Rates

- (a) The polymer coverage rates shown in Table 7 and Table 8 are the maximum deck areas to be covered by one (1 L) litre of undiluted polymer applied to a smooth shot-blasted deck surface. The area covered by one (1 L) litre of polymer shall be decreased accordingly by the Contractor to accommodate all deck surface build-up

required to depths of 6 mm and deck crack sealing. This may be necessary as a result of extra removals that occur during deck surface preparation as a consequence of the deck having areas of scaling, weaker concrete mix, deterioration, surface irregularities, wheel path wear, etc. Extra polymer material may also be required due to coarse texturing or grooving of the deck surface, or porosity of the concrete. No additional payment will be made for extra polymer required for deck surface build-up.

TABLE 7 EPOXY POLYMER COVERAGE REQUIREMENTS LITRES PER SQUARE METRE (L/M <sup>2</sup> )		
1 <sup>st</sup> Layer	2 <sup>nd</sup> Layer	3 <sup>rd</sup> Layer
1.33	2.00	0.25

TABLE 8 MMA POLYMER COVERAGE REQUIREMENTS LITRES PER SQUARE METRE (L/m <sup>2</sup> )		
Primer Layer	Premixed Basecoat Layer	Sealer layer
0.4	5.0	0.67

E4.3.3 Aggregate Application Quantities

- (a) The type and amount of aggregate to be used are shown in Table 9 and Table 10. Note that the coverage rates shown include only the amounts to be retained in the membrane layers and do not include the excess aggregate that will be removed (normally thirty (30%) to fifty (50%) percent of the total aggregate placed, depending on the skill used in placing).

TABLE 9 EPOXY POLYMER AGGREGATE REQUIREMENTS TYPE/AMOUNT KILOGRAMS PER SQUARE METRE (kg/m <sup>2</sup> )	
1 <sup>st</sup> Layer	2 <sup>nd</sup> Layer
Fine 6 kg/m <sup>2</sup>	Coarse 7 kg/m <sup>2</sup>

TABLE 10 MMA POLYMER SEED AGGREGATE REQUIREMENTS KILOGRAMS PER SQUARE METRE (kg/m <sup>2</sup> )		
Primer Layer	Basecoat Layer	Sealer Layer
0.5	5 – 10	N/A

E4.3.4 Deck Application Layout

- (a) Prior to the application of each layer, the Contractor shall submit a sketch showing the deck surface divided into segments to be covered by each batch of non-skid polymer wearing surface. The length of each segment shall take into account the overlay width, including 100 mm face on shoulder traffic barriers, surface roughness, the coverage rate, the amount of epoxy in each batch, and losses in application equipment and containers.

- (b) After approval of the layout sketches, masking tape shall be applied to the deck surface to accurately outline the boundaries of all segments. No overlay Work shall commence until all layout by masking tape has been acceptably completed.

#### E4.3.5 Proportioning and Mixing of Epoxy Resin Components

- (a) It is the responsibility of the Contractor to calibrate his batching operation before each day's production run. Such calibration shall be recorded in writing for verification by the Contract Administrator. The approved methods of batching the epoxy resin shall be either by calibrated static mixer or pre-measuring each epoxy component in separate calibrated pails prior to transferring each component into a single pail for mixing. Records of calibration shall contain the method of determining batch volumes of epoxy components. In the case of static mixing heads, epoxy resin components shall be run into two (2) separate measuring containers equipped with accurate volume marks for a given time period. The material shall be drawn from a disconnected feed upstream of the static mixing head and downstream from the pump.
- (b) At the end of the test, the two (2) volumes shall be measured and shall agree with the manufacturer's specified mix ratio. This calibration shall be repeated if the temperature of the epoxy resin mix material changes more than five degrees Celsius (5°C).
- (c) Addition, and in the case of pre-measuring of the epoxy resin components in separate pails, such pails shall be filled with water from a measuring container equipped with accurate volume marks until the desired batch quantities have been reached. The measuring containers shall then be marked at the top of the water column with a permanent mark.
- (d) The epoxy resin components shall be mixed in batches no larger than twenty (20 L) litres. Each component shall be measured to an accuracy of three percent (3%). All containers shall be clean and free of contaminants or hardened epoxy. Containers used for mixing and blending shall not be used for measuring.
- (e) The epoxy resin components shall be thoroughly mixed and blended together for a period of time specified in the manufacturer's instructions. After mixing, the epoxy resin components shall be transferred into another clean pail for further mixing. In all cases, in the absence of a manufacturer's time limit for mixing, the minimum time limit for mixing shall not be less than three (3) minutes. Attention shall be given to blend the epoxy resin components adjacent to the mixing container surface. Air or Water bubbles or other contaminants in the completed epoxy resin mix will be cause for rejection of that batch. The Contractor shall make a small mixed epoxy resin mix sample from each batch in fifty (50 ml) millilitre aluminum foil dish or similar container and label it with the deck location of that batch. These labelled samples shall be submitted to the Contract Administrator the following day.
- (f) When mixing operations are carried out on or near the bridge deck, the deck and adjacent areas shall be protected from spillage of epoxy resin components, solvents, and other materials. Any such materials that are spilled on any part of the bridge shall be removed by the Contractor at his own expense to the satisfaction of the Contract Administrator.

#### E4.3.6 Application Timing for Epoxy Resin Mix

- (a) Once mixed, the liquid epoxy resin mix is in a temperature and time-sensitive condition. The temperature of the deck, air, epoxy resin mix, and aggregate will have a significant effect on the timing aspects of this Work, including mixing times required, application times, completion of aggregate seeding, rate of strength gain, cure time required prior to beginning successive layers, and cure time required prior to allowing traffic on completed overlay. Similarly, other factors, such as the ratio of the epoxy resin components, the degree of thoroughness of the mixing of epoxy resin

components, the presence of direct sunlight on the deck and/or stored materials, or on mixing equipment may also influence the timing required to perform this Work. In addition, the temperature, wind, and sunlight conditions will vary during the course of the day. It is the Contractor's responsibility to follow the manufacturer's instructions on the use of their materials while minimizing the adverse effects of other variables noted above. Failure of the Contractor to comply with the above requirements will result in suspension of the Work at the discretion of the Contract Administrator.

#### E4.3.7 Proportioning and Mixing of MMA Resins

- (a) Proportioning of primers, basecoats and sealers shall be done by weight. The scales shall be accurate within three percent (3%). The initiator may be added with a marked volumetric measure. In this case the vessel shall be calibrated and marked with volumetric marks using a weigh scale and the appropriate dosage weight initiator.
- (b) Mixing shall be adjusted so that the mixer does not entrap air or induce significant temperature increases. The mixture shall be tested for segregation in the field by density determinations performed on the top and bottom portion of two (2) sample batches prior to adding the initiator. The densities shall not vary by more than eight percent (8%).

#### E4.3.8 Weather Conditions, Dryness of Concrete Substrate and Polymer Layers

- (a) The Work of this Contract shall be done in suitable conditions of temperature, wind, dust, and moisture. If weather factors or moisture conditions of the substrate concrete are detrimental to the acceptable placement of the overlay, the Work shall be suspended until suitable conditions exist. Mixing, placing and curing of polymer shall be done at ambient air and substrate concrete temperatures between 10°C and 27°C. The Contract Administrator's decision on the suitability of weather conditions shall be final.
- (b) The concrete substrate, including concrete patching and repairs shall be completely dry before the first layer of polymer is applied. Subsequent layers of polymer shall not be applied until previous layers are completely cured. Presence of moisture will be determined by the modified ASTM D4263, "Standard Test Method for Indicating Moisture in Concrete by Plastic Sheet Method". This test shall be carried out on the concrete substrate as well as on previous placed polymer overlays. The Contractor shall place a minimum of four (4) test windows, per application area, at different time periods. The test windows shall consist of three (3) layers of clear and one (1) layer of black heavy duty six (6)µm poly, 1000mm x 500 mm located in moisture prone areas. The test windows shall be heated at a temperature of 55°C continuously for a time period of six (6) hours for each test and at a time duration, period and frequency of test, as determined by the Engineer. Timing of the test windows shall not start until the temperature of the concrete surface has reached 55°C. This will not relieve the Contractor from his responsibility to ensure that the overlay does not debond. The Contractor shall provide four (4), 500 watt halogen lamps and a portable electric generator (3500 watt) and carry out required testing which will be considered incidental to the Contract and no separate or additional payment will be made.
- (c) Application of the first layer is recommended when there is sufficient evidence of declining deck concrete temperatures.

#### E4.3.9 Application of Epoxy Resin Mix

- (a) Only after the Contract Administrator's acceptance of the surface preparation and repairs to the deck surface, and satisfactory submission of a Deck Application Layout plan by the Contractor, shall the epoxy resin mix be applied in accordance with the manufacturer's instructions regarding mixing, blend time, temperature, time between layers, pot life, method of application, condition of substrate and any other requirements. Non-compliance with any of these requirements which may cause

rapid gelling of the epoxy resin mix, failure to gel, poor bond, thermal incompatibility, or other failures, will result in rejection of the application, and require removal and repair of the same by the Contractor at the Contractor's expense.

- (b) The waterproofing ability of the non-skid polymer wearing surface is reduced by pinholes or defects in the layers. The Contractor should note that the results of the out-gassing and in-gassing of the concrete deck can produce an unacceptable number of pinholes, resulting in rejection of the overlay or repair at the Contractor's expense.
- (c) Out-gassing is related to the behavior of water in the pore of the concrete. Changing deck temperatures result in phase changes of water from liquid to gas and create bubbles, blisters, pinholes, or other defects.
- (d) The Contractor shall use application procedures that prevent pinholing. **He shall apply the first layer of epoxy resin mix during low sunlight and declining deck temperatures.** Application of this first layer shall not be commenced unless the deck temperature has continuously declined at least five degrees Celsius (5°C) during the preceding thirty (30) minutes. The Contract Administrator's decision as to the suitability of environmental conditions affecting the placement shall be final.
- (e) The Contractor shall spread the epoxy resin mix uniformly over the pre-measured area using a squeegee and roller brush or spraying equipment to carefully work the epoxy resin mix into the surface and obtain the required depth. Defects in the spreading operation that are apparent in the final product will require remedial work. Spiked footwear will be permitted for use by personnel involved in the application work, but only prior to gelling of the epoxy resin mix and with constraint that all damage or defects in the surface will be repaired. Spreading and levelling of fresh epoxy resin mix shall be completed while material is in a state of low viscosity, and within seven (7) minutes of batching. Failure to comply with the seven (7) minute limit will result in rejection of the epoxy resin mix batch. Application of material which has begun to gel and increase in viscosity will not be permitted.
- (f) Each layer on the non-skid polymer wearing surface shall be applied continuously between expansion joints. Intermediate transverse cold joints will not be permitted unless approved, in advance, by the Contract Administrator, as specified herein.
- (g) All longitudinal lane cold joints in the overlay, including those overlays previously applied by others, shall be overlaid a minimum of 25 mm or as recommended by the manufacturer, from the cold joints of previous layers of overlay. To ensure straightness, masking tape shall be applied along the perimeter of all repair areas as well as along all steel deck joints, drains, curb faces, or other edges of the layers of overlay. The seeded layers of epoxy resin mix shall extend up the concrete curb or parapet faces a minimum distance of 100 mm. Where sawcuts have been employed to cut existing membranes and protective coverings, the boundary taping, and epoxy resin mix application shall be done in such a manner to ensure full sealing of the sawcut flush to the surface of the completed overlay. All masking tape used to define the boundaries of each segment shall be completely removed prior to gelling of the epoxy resin mix.

#### E4.3.10 Application of MMA Resin Mix

- (a) The Degadur basecoat mixture shall be prepared by blending the silica flour and basaltic and components with the resin in a suitable container (e.g. 20 L pail), followed by the addition and subsequent blending of the initiator. The mixture shall be applied over clean, dry, cured primer surfaces at 5 mm thickness using a draw box and trowels, or an approved equivalent.
- (b) The draw box shall be equipped with an adjustable rear gate allowing for openings of 0 to 5 mm at the bottom of the box. Typical box dimensions are 600 mm wide, 150 mm long and 150 mm deep. The box, which does not contain a bottom, is filled with

base course material and drawn along the prepared deck surface in single, continuous passes. The design thickness of the overlay, including the seeded base course, shall be 8 mm. The applicator shall take care to allow the ridges between passes to self-level before broadcasting aggregate. Small areas may be touched up with a steel trowel.

- (c) The deck layout may be subdivided into coverage areas corresponding to a maximum of one-hundred (100 L) litres of MMA mix.
- (d) Applicators shall not walk on fresh polymer layer except for the first four (4) minutes after placement. During this period, golf shoes equipped with spikes must be worn.
- (e) The Degadur sealer mix shall be applied to the cured and swept basecoat using paint rollers and brushes. Application shall be in a "dip-and-roll" manner from containers holding no more than eight (8) litres at a time. **Sealer shall not be poured directly onto the deck.**

#### E4.3.11 Anchoring of Wearing Surface Edges

- (a) In order to prevent bond failures at the edges of the wearing surface at high impact locations and adjacent to bridge deck lanes not treated with the non-skid polymer overlay, 12 mm deep by 10 mm wide grooves as shown on the Drawings shall be cut by router or saw immediately behind and parallel to all deck drains and all other transverse edges. These grooves or keys are intended to provide increased anchorage for the overlay and shall be properly filled with polymer and then sealed. To ensure the flush interface between the finished wearing surface and the expansion joints, the deck area for 300 mm adjacent to the deck expansion joints shall be removed by chipping to a depth of 6 mm at the outside edge and increasing the chipping to 12 mm at the expansion joint. To ensure the flush interface between the finished wearing surface and the deck drains, the deck area for 300 mm adjacent to the deck drains shall be removed by chipping to a depth of 6 mm. Both expansion joint and deck drain areas shall then be followed by shot-blast surface preparation to permit the installation of the non-skid polymer wearing surface. Rough spots exceeding 3 mm in height on or adjacent to, deck joints and drains shall be removed to provide a smooth transition across the deck joints and/or drains. Anchoring of wearing surface edges shall be considered incidental to the application of the non-skid polymer wearing surface and no extra payment will be considered.

#### E4.3.12 Seeding of Aggregate

- (a) For each layer of the non-skid polymer wearing surface, the aggregate shall be seeded into the fresh polymer resin mix prior to commencement of gelling or an increase in viscosity in such a manner that no ripples or waves are created in the polymer resin mix. This requires the aggregate to impact the fresh polymer resin mix surface in a near vertical direction. Improper seeding technique will result in the Work being suspended until proper methods are employed. The aggregate shall be placed so that an excess quantity covers an entire surface of the fresh epoxy resin mix, such that no polymer is visible, and such that the surface has a dry appearance. As the aggregate settles into the fluid polymer resin mix, wet spots that may appear on the surface shall be promptly reseeded with additional aggregate while the polymer resin mix is still in a low viscosity condition. At no time shall the Contractor attempt to disturb already placed aggregate in an effort to cover surface wet spots. After commencement of gelling of the polymer resin/aggregate layer being applied, walking on this layer will not be permitted until it has properly and fully cured.
- (b) **WARNING:** All dust and fines from the air or from the aggregate result in reduced waterproofing performance of the finished wearing surface. Care shall be taken to prevent dust from entering each wearing surface layer until it has set. If compressed air is used for seeding, it shall be done in such a manner that fines are separated from the aggregate and are not allowed to contaminate the layer.

- (c) In the event that insufficient aggregate has been placed and the wet areas harden to form glassy, resin-rich areas, the Contractor shall remove all of these areas to sound concrete and reapply the wearing surface layer in a proper manner at the Contractor's expense.
- (d) Upon curing of each wearing surface layer, and upon approval of the Contract Administrator, all excess aggregate or other contaminants shall be removed from the surface by power sweeping and air blasting prior to applying a subsequent layer of polymer resin mix. Additional cleaning will be required if application of subsequent layers of polymer resin mix are delayed and the overlay surface is contaminated.  
 Note: All excess aggregate removed from each layer shall be disposed of, off and away from the site. In no case **shall this aggregate be reused. Only new, clean, dry aggregate shall be used in the seeding operation.**

E4.3.13 Smoothness of Finished Wearing Surface

- (a) Although larger defects in smoothness of the bridge deck shall be repaired by patching, as directed by the Contract Administrator, all minor irregularities, wheel path wear and defects of up to 6 mm depth in the concrete deck shall be smoothed by the application of the constituent layers of non-skid polymer wearing surface.
- (b) Roughness attributable to the overlay will be tested with a 3 m long straight edge. When placed anywhere, in any direction on the surface, except for on the crown, the gap between the bottom of the straight edge and the surface of the overlay shall not exceed 3 mm. Furthermore, a regular frequency of gaps and ridges producing a washboard finish, even with specified limits, will be rejected. Corrective measures, as approved by the Contract Administrator, will be undertaken by the Contractor at his own expense.
- (c) The location and number of measurements taken will be at the discretion of the Contract Administrator.

E4.3.14 Physical Properties of Wearing Surface

- (a) The completed non-skid polymer wearing surface shall be light in colour, reflective, durable, waterproof, skid resistant, and meet or exceed the physical properties shown in Table 10 at twenty-eight (28) days after placing:

<b>TABLE 10 PHYSICAL PROPERTIES OF COMPLETED WEARING SURFACE</b>			
<b>Repair Class</b>	<b>Skid Resistance (ASTM E670-87)</b>	<b>Resistivity (ASTM D3633-83) (ohms)</b>	<b>Bond Strength (MPa)</b>
A	75	1,000,000	3.0

E4.3.15 Opening to Traffic

E4.3.15.1 Epoxy Aggregate System

- (a) The non-skid polymer wearing surface shall not be exposed to traffic except with the approval of the Contract Administrator. The Contract Administrator's approval will be based on the maturity of the completed wearing surface. As an aid to measuring the rate of strength gain, 50 mm epoxy-aggregate mortar cubes may be cast by the Contract Administrator from randomly selected batches of mixed epoxy resin mix as it is being placed on the deck. These cubes will be allowed to cure under the same ambient weather conditions as the overlay, and shall have attained a compressive strength of at least 20 MPa.
- (b) Normally a set of three (3) cubes will be sampled from the final batch applied. The Contractor shall select the age at which these three (3) cubes are to be tested, and will bear all costs of testing should the cubes not achieve 20 MPa. If the cube

strengths are less than 20 MPa, traffic shall be kept off of the completed wearing surface for an additional forty-eight (48) hours or longer, at the discretion of the Contract Administrator.

#### E4.3.15.2 MMA Aggregate System

- (a) The basecoat shall be cured at least one (1) hour, or until brooming or vacuuming can be performed without tearing or otherwise damaging the surface and no traffic or equipment shall be permitted on the basecoat surface during the curing period. After the curing period, all loose aggregate shall be removed by brooming or vacuuming in preparation for the sealer application. The unsealed basecoat shall not be opened to traffic. If traffic has to be accommodated due to extenuating circumstances, the basecoat shall be thoroughly cleaned of all impurities with sand blast or shotblast equipment and any resulting loss of MMA shall be replaced before the seal coat is applied.
- (b) The Contractor shall plan and prosecute the Work so as to provide a minimum of thirty (30) minutes cure on the primer course and one (1) hour cure on the sealer course prior to opening that section to public or construction traffic. Job scheduling may be accommodated by the opening of cured primer surfaces to traffic while other sections of the deck are prepared.
- (c) As an aid to measuring the rate of strength gain of the MMA basecoat, 50 mm cubes will be cast by the Contract Administrator from randomly selected batches as they are being placed on the deck. These cubes will be allowed to cure in the same ambient weather conditions as the overlay and shall have attained a minimum compressive strength of 16 MPa prior to traffic being allowed on the completed overlay. In addition, the final seal coat shall be cured for at least one (1) hour before the completed overlay may be opened up to public traffic.

#### E4.3.16 Clean Up

- (a) Upon completion of the Work, the entire deck surface shall be re-cleaned with a power sweeper and air-blasted to remove all loose aggregates and sandblasting sand. The site shall be cleaned of all surplus materials or spillage involved in the Work. Debris from clean up shall be hauled from the site and properly disposed of, incidental to this Work.

#### E4.4 Quality Control

##### E4.4.1 Inspection

- (a) All workmanship and all materials furnished and supplied under the Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations, from the selection and production of the Work, through to the final acceptance of the specified Work. The Contractor shall be wholly responsible for the control of all operations, incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.
- (b) The Contractor shall notify the Contract Administrator at least twenty-four (24) hours in advance of inspections and approvals to proceed to subsequent **phases of the work are desired.**

##### E4.4.2 Qualifications of Contractor

- (a) The non-skid polymer wearing surface shall be installed by a Manufacturer's Certified Applicator. The applicator shall provide satisfactory evidence of their previous experience in installing non-skid polymer wearing surfaces.

E4.4.3 Materials

- (a) All materials supplied under this specification shall be subject to testing and approval by the Contract Administrator in accordance with E4.2.2.

E4.4.4 Compressive Strength

- (a) Notwithstanding the Contractor's responsibility to provide routine quality control testing, the Contract Administrator may, at his discretion, perform compressive strength testing.
- (b) Samples of the polymer resin mix material will be randomly selected and used to cast 50 mm cube specimens for compressive strength testing in accordance with test method ASTM C-109. These tests will be used for acceptance or rejection of the Work and determination of payment range as specified below in Table 12. The test specimens will be cast with a ratio of 2.5 parts by volume of coarse aggregate to 1 part by volume of mixed epoxy. The cube specimens will be cured for seven (7) days in dry lab conditions prior to testing. The compression test will be done using a steady loading rate of 0.5 MPa  $\pm$  0.05 MPa per second.
- (c) The strength will be defined as the maximum load measured or the load resulting in a 2.5 mm deflection of the cube being loaded in the event this occurs prior to reaching the maximum load. This ASTM C-109 test method will also be used for approval testing of potential overlay materials.
- (d) At the discretion of the Contract Administrator, Samples will be cast for compressive strength testing as measure of quality control of batching procedures. The approved products identified in Table 11 shall have a minimum seven (7) day compressive strength as shown therein.

<b>Product</b>	<b>7 Day Compressive Strength (MPa)</b>
Flexolith / Trafficguard	40 (min.)
Sternflex	39.0 (min.)
Degadur MMA	16.0 (min.)

- (e) In the event that a seven (7) day compressive strength test specimen fails to reach the specified minimum compressive strength, the City of Winnipeg Engineering Division, at their discretion, accept the wearing surface at a reduced rate of payment as shown in Table 12. For a test specimen taken on any layer of the wearing surface, the reduced rate of payment will be applied by the Contract Administrator to the unit bid price for the entire thickness of overlay that has been placed in the area represented by a low test result. Each test specimen will be taken to represent up to a maximum of fifty square metres (50 m<sup>2</sup>) of wearing surface installed during the same placement operation.

<b>TABLE 12            REDUCED PAYMENT SCHEDULE            (for Reduced Compressive Strength)</b>			
<b>Flexolith            Trafficguard            (MPa)</b>	<b>Degadur (MMA)</b>	<b>Sternflex (MPa)</b>	<b>Percentage of            Unit Price</b>
40 and over	16 and over	39.1 and over	100%
38.0 to 40.0	15.0 to 15.9	37.3 to 39.1	90%
36.0 to 38.0	14.0 to 14.9	35.5 to 37.3	80%
34.0 to 36.0	13.0 to 13.9	33.7 to 35.5	70%
32.0 to 34.0	12.0 to 12.9	31.9 to 33.7	60%
30.0 to 32.0	11.0 to 11.9	30.0 to 31.9	50%
Below 30.0	Below 11.0	Below 30.0	0% (Rejected)

**E4.4.5 Corrective Action**

- (a) Failure to comply strictly with the polymer manufacturer's instructions regarding storage, mixing, application methods, weather conditions, timing, or other instructions will result in rejection, removal, and replacement of the Work by the Contractor at the Contractor's expense. Similarly, any delay in spreading the polymer on the deck or in seeding the aggregates, failure to consider wind, rain, temperature conditions, or other improper workmanship resulting in a non-uniform distribution of aggregates or segregation of aggregates in the overlay or unsatisfactory roughness will result in rejections of the Work.

**E4.5 Measurement and Payment**

**E4.5.1 Non-Skid Polymer Wearing Surface**

- (a) Supply and installation on the non-skid polymer wearing surface will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Non-Skid Polymer Wearing Surface". The area to be paid for will be the total number of square metres of non-skid polymer overlay installed in accordance with the specification, accepted and measured by the Contract Administrator.

**E5. NORTH ABUTMENT CONCRETE REPAIRS**

**E5.1 Description**

- (a) This Specification shall cover all concrete repairs to the east face of the west cast-in-place concrete traffic barrier at the North Abutment using a polymer-modified portland cement mortar, including installation of a precompressed joint filler to relieve the stresses that caused the initial damage.
- (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.

**E5.2 Materials**

**E5.2.1 General**

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

#### E5.2.2 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.

#### E5.2.3 Mortar

- (a) The mortar shall be a rheoplastic, pourable, shrinkage-compensated, fibre reinforced repair product. The mortar product shall be EMACO S66 CI by Masterbuilders or equivalent as approved by the Contract Administrator. Mix in accordance with manufacturer's specifications, including addition of aggregate for deep repairs.

#### E5.2.4 Precompressed Expanding Joint Filler

- (a) Expanding joint filler units shall be single seal units comprised of water-based, stabilized, polymer-modified acrylic impregnated expanding foam sealant with internal laminations of closed cell foam.
- (b) Material to be supplied in sticks pre-compressed to less than the joint size at mean temperature for ease of installation. Stick material to contain a pressure sensitive adhesive on one face.
- (c) Material to be installed recessed 6mm from substrate faces and to receive a field-applied coating of low-modulus liquid sealant not to exceed 6mm thick.
- (d) An approved product is the Emseal Backerseal (Greyflex) hybrid sealant system, manufactured by Emseal Corporation, 84 Brydon Drive, Rexdale, Ontario, Canada, M9W 4N6.

#### E5.3 Equipment

- E5.3.1 All equipment shall be a type approved by the Contract Administrator and shall be kept in good working order.

#### E5.4 Construction Methods

##### E5.4.1 Concrete Removal and Surface Preparation

- (a) Concrete is to be removed a minimum of 50mm or to the depth of deterioration, whichever is greater. Concrete shall be removed a minimum of 20mm behind reinforcing steel bars if more than half the bar diameter is exposed. The resulting surface is to be rough with a minimum amplitude of 6mm a maximum frequency of 15mm.
- (b) Limits of the repair area to be sawcut 20 mm to provide a well-defined interface and bonding surface with the existing sound concrete.
- (c) After removal of concrete but before placement, the concrete surface shall be mechanically abraded to provide additional mechanical bond. Epoxy coated reinforcing steel shall be touched up with approved epoxy paint.
- (d) Formwork shall be as approved by the Contract Administrator.

- (e) Unless specifically stated in the manufacturer's instructions that it is not required, immediately prior to placing the repair mortar, a latex-bonding agent shall be applied to the entire surface of the substrate concrete.

#### E5.4.2 Mixing and Placing Mortar

- (a) The Contract Administrator must be notified at least twenty-four (24) hours prior to placing mortar so that an adequate inspection may be made of the prepared concrete substrate surface and related works. Placement without required prior notification will not be allowed.
- (b) Equipment for mixing or conveying the mortar shall be thoroughly flushed with clean water prior to commencement of the repair operation. All equipment and processes are subject acceptance by the Contract Administrator.
- (c) The mortar shall be mixed into a flowable, homogeneous consistency.

#### E5.4.3 Installation of Precompressed Expanding Joint Filler

- (a) Block-outs shall be incorporated into the concrete repairs at the locations shown on the Drawings for subsequent installation of the expanding joint fillers.
- (b) Prior to installing the precompressed fillers, the joint surfaces shall be thoroughly cleaned and must be free from gross irregularities, loose particles, foreign matter such as dirt, dust, ice, snow, water, etc., and coatings such as grease, oil, release agents, lacquers, etc. that may be detrimental to the adhesion of the sealant.
- (c) Sealant system shall be installed in accordance with fully detailed manufacturer's instructions using the recommended epoxy adhesive and topcoat.

#### E5.5 Quality Control

- E5.5.1 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.

#### E5.6 Measurement and Payment

- E5.6.1 The North Abutment concrete repairs will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for the "North Abutment Concrete Repairs", performed in accordance with this Specification and accepted by the Contract Administrator.