



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 4-2018**

**CHIEF PEGUIS GREENWAY EXTENSION – FROG PLAIN WAY TO HENDERSON  
HIGHWAY**

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## **PART B - BIDDING PROCEDURES**

### **B1. CONTRACT TITLE**

B1.1 CHIEF PEGUIS GREENWAY EXTENSION – Frog Plain Way to Henderson Highway

### **B2. SUBMISSION DEADLINE**

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, March 9<sup>th</sup>, 2018.

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

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

### **B3. SITE INVESTIGATION**

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

### **B4. ENQUIRIES**

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

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

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

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

B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

### **B5. CONFIDENTIALITY**

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

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

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

## **B6. ADDENDA**

- B6.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

## **B7. SUBSTITUTES**

- B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least three (3) Business Days prior to the Submission Deadline.
- B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
  - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
  - (c) identify any anticipated cost or time savings that may be associated with the substitute;
  - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
  - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.
- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

- B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B17.
- B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

## **B8. BID COMPONENTS**

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
  - (b) Form B: Prices, hard copy;
  - (c) Bid Security
    - (i) Form G1: Bid Bond and Agreement to Bond, or  
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or  
a certified cheque or draft;
- B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.
- B8.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.
- B8.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B8.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B8.4.2 A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.
- B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.
- B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B17.1(a).
- B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B8.8 Bids shall be submitted to:
- The City of Winnipeg  
Corporate Finance Department  
Materials Management Division

185 King Street, Main Floor  
Winnipeg MB R3B 1J1

**B9. BID**

- B9.1 The Bidder shall complete Form A: Bid, making all required entries.
- B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;
  - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
  - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
  - (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.
- B9.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B9.4 Paragraph 13 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;
  - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
  - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, shall be affixed;
  - (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.
- B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

**B10. PRICES**

- B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B10.1.1 For the convenience of Bidders, and pursuant to B8.4.2 and B17.4.2, an electronic spreadsheet Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B10.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

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

**B11. DISCLOSURE**

B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B11.2 The Persons are:

- (a) N/A

**B12. QUALIFICATION**

B12.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
- (b) be financially capable of carrying out the terms of the Contract; and
- (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.

B12.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B12.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) have successfully carried out work similar in nature, scope and value to the Work; and
- (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);

B12.4 Further to B12.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

- (a) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) or
  - (i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
  - (ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program or
- (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information

Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>.

- B12.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B12.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

### **B13. BID SECURITY**

- B13.1 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.
- B13.1.1 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.
- B13.1.2 All signatures on bid securities shall be original.
- B13.1.3 The Bidder shall sign the Bid Bond.
- B13.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.
- B13.2 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.
- B13.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B13.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.
- B13.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.
- B13.3 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.

### **B14. OPENING OF BIDS AND RELEASE OF INFORMATION**

- B14.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.
- B14.1.1 Bidders or their representatives may attend.

- B14.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B13 will not be read out.
- B14.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B14.3 After award of Contract, the name(s) of the successful Bidder(s), their address(es) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B14.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).
- B14.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

## **B15. IRREVOCABLE BID**

- B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B15.2 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.

## **B16. WITHDRAWAL OF BIDS**

- B16.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B16.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B16.1.2 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 13 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B16.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
  - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 13 of Form A: Bid; and
  - (c) if the notice has been given by any one of the persons specified in B16.1.3(b), declare the Bid withdrawn.
- B16.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B15.2 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.

## **B17. EVALUATION OF BIDS**

B17.1 Award of the Contract shall be based on the following bid evaluation criteria:

- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation therefrom (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B7.

B17.2 Further to B17.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.

B17.4 Further to B17.1(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.

B17.4.1 Further to B17.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17.4.2 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

## **B18. AWARD OF CONTRACT**

B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B18.2 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.

B18.2.1 Without limiting the generality of B18.2, 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.

B18.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B17.

**B18.3.1** Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

## **PART C - GENERAL CONDITIONS**

### **C0. GENERAL CONDITIONS**

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at [http://www.winnipeg.ca/matmgt/gen\\_cond.stm](http://www.winnipeg.ca/matmgt/gen_cond.stm)
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

## **PART D - SUPPLEMENTAL CONDITIONS**

### **GENERAL**

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

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

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

D2.1 The Work to be done under the Contract shall consist of:

- (a) Active Transportation Corridor and Corridor Amenities
  - (i) Frog Plain Way to Henderson Highway
- (b) Intersection Improvement
  - (i) Chief Peguis Trail at Main Street
- (c) Structural Work
  - (i) Kildonan Settlers Bridge
- (d) Pedestrian Lighting and Associated Works
  - (i) Frog Plain Park and Kildonan Settlers Bridge

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

- (a) Active Transportation Corridor and Corridor Amenities
  - (i) Protection of existing trees;
  - (ii) Removal of trees;
  - (iii) Clearing and grubbing;
  - (iv) Implementation and maintenance of erosion control measures;
  - (v) Common excavation;
  - (vi) Installation of catch basins and corrugated steel culvert;
  - (vii) Placement of sub-base and base course material;
  - (viii) Construction of 3.5m Type 1A Asphalt pathway;
  - (ix) Construction concrete retaining wall with 4.0m concrete pathway;
  - (x) Installation of drain tiles;
  - (xi) Construction of swale/ditch;
  - (xii) Removal and salvaging existing aluminum balanced barrier;
  - (xiii) Installation of aluminum balanced barrier;
  - (xiv) Boulevard/slope grading;
  - (xv) Tree planting and soft landscaping; and
  - (xvi) Installation of site furniture.
- (b) Intersection Improvement
  - (i) Concrete pavement removal;
  - (ii) Sidewalk removal;
  - (iii) Miscellaneous concrete removal;
  - (iv) Excavation;
  - (v) Placement of geotextile fabric;
  - (vi) Placement of sub-base and base course material;
  - (vii) Installation of dowel assemblies;
  - (viii) Construction of 230mm concrete pavement (Plain Dowelled);

- (ix) Construction of 180mm barrier or modified curb;
  - (x) Placement of Type 1A Asphalt Overlay (50mm);
  - (xi) Installation of catch basins and connection pipe;
  - (xii) Installation of subdrains;
  - (xiii) Placement of utility conduits;
  - (xiv) Construction of median safety curb;
  - (xv) Removal and salvaging existing aluminum balanced barrier;
  - (xvi) Construction of splash strip;
  - (xvii) Installation of 150mm reinforced bus pad;
  - (xviii) Installation of 100mm sidewalk with concrete blockouts;
  - (xix) Installation of interlocking paving stones;
  - (xx) Installation of coloured bike lane;
  - (xxi) Plant material;
  - (xxii) Removal of existing overhead structure;
  - (xxiii) Abandoning existing overhead structure foundation;
  - (xxiv) Installation of new overhead structure foundation; and
  - (xxv) Installation of new cantilever overhead structure;
- (c) Structural Work
- (i) Implement traffic control and management;
  - (ii) Precast concrete traffic barrier delivery and installation;
  - (iii) Removal of existing bridge barrier
  - (iv) Installation of new bridge barrier;
  - (v) Hydro-demolition of existing sidewalk;
  - (vi) Installation of new sidewalk;
  - (vii) Modification to existing deck drain; and
  - (viii) Modification to existing concrete stairs;
- (d) Pedestrian Lighting and Associated Works
- (i) Installation of cast-in-place concrete pile;
  - (ii) Luminaire installation;
  - (iii) Installation of waterproof panel board;
  - (iv) Connecting to existing panel board;
  - (v) Placement of utility conduits; and
  - (vi) Installation of pedestrian lighting;

### **D3. DEFINITION**

D3.1 When used in this Bid Opportunity:

- (a) "ASTM" means American Society for testing and Materials;
- (b) "CSA" means Canadian Standards Association.

#### **D4. CONTRACT ADMINISTRATOR**

D4.1 The Contract Administrator is WSP Canada Group Ltd., represented by:

Vilko Maroti, CET, P.Eng.  
Director, Highways Urban Centres Manitoba  
Transportation

Telephone No. 204-227-5795 Email Address Vilko.Maroti@wsp.com

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

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

#### **D5. CONTRACTOR'S SUPERVISOR**

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

D5.2 At least two (2) business days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

#### **D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE**

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

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

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

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

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

#### **D7. NOTICES**

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

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

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

The City of Winnipeg  
Attn: Chief Financial Officer  
Office of the Chief Administrative Officer  
Susan A. Thompson Building  
2nd Floor, 510 Main Street  
Winnipeg MB R3B 1B9

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

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

- D7.5 Bids Submissions must not be submitted to this facsimile number. Bids must be submitted in accordance with B8.**

#### **D8. FURNISHING OF DOCUMENTS**

- D8.1 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/her at cost.

### **SUBMISSIONS**

#### **D9. AUTHORITY TO CARRY ON BUSINESS**

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

#### **D10. SAFE WORK PLAN**

- D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.
- D10.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/safety/default.stm>
- D10.3 The Contractor shall be aware that inside the steel girders of Kildonan Settler Bridge considered a confined space and shall follow the "Guidelines for confined Entry Work" as published by the Manitoba Workplace Safety and Health Division. Prior to the commencement of any work, the Contractor shall submit a Safety and Health – Safe Work Plan to the Contract Administrator for review and acceptance by the City

#### **D11. INSURANCE**

- D11.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a

cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

- (b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence;
- (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

D11.2 Deductibles shall be borne by the Contractor.

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

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

## **D12. PERFORMANCE SECURITY**

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

- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
- (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
- (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

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

D12.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B13.1(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 and in no event later than the date specified in the C4.1 for the return of the executed Contract.

## **D13. SUBCONTRACTOR LIST**

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

#### **D14. DETAILED WORK SCHEDULE**

- D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.
- D14.2 The detailed work schedule shall consist of the following:
- (a) a Gantt chart for the Work acceptable to the Contract Administrator.
- D14.3 Further to D14.2(a), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

#### **D15. ENVIRONMENTAL PROTECTION PLAN**

- D15.1 Prior to commencing construction activities or delivery of materials to Site, submit an Environmental Protection Plan for review and approval by Contract Administrator. The Environmental Protection Plan shall present a comprehensive plan to address all of the Contractor's chosen means and methods towards performing the Work that may impact the environment. The submission of the Environmental Protection Plan to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the success or failure of all environmental management practices and procedures.
- D15.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:
- (a) Federal
    - (i) Species at Risk Act, 2002, c. 29;
    - (ii) Migratory Birds Convention Act, 1994, c. 22;
    - (iii) Fisheries Act, 1985, c F-14 and 2012/2013 Amendments;
    - (iv) Navigation Protection Act, 1985, c. N-22; and
    - (v) Any other applicable Acts, Regulations and By-laws;
  - (b) Provincial
    - (i) The Dangerous Goods Handling and Transportation Act, D12;
    - (ii) Manitoba Endangered Species and Ecosystems Act, c. E111;
    - (iii) Threatened, Endangered and Extirpated Species Regulation, 25/98, Section 10;
    - (iv) The Environment Act, c. E125;
    - (v) The Wildlife Act, c. W130;
    - (vi) The Water Protection Act, c. 26;
    - (vii) The Workplace Safety and Health Act c.W210;
    - (viii) The Heritage Resources Act, c. H391; and
    - (ix) Any other applicable Acts, Regulations, and By-laws;
  - (c) Municipal
    - (i) The City of Winnipeg Waterways By-law, No. 5888/92;
    - (ii) City of Winnipeg *Best Management Practices for Activities In and Around the City's Waterways and Watercourses*, City of Winnipeg 2005;
    - (iii) The City of Winnipeg Motor Vehicle Noise Policies and Guidelines; and
    - (iv) Any other applicable Acts, Regulations, and By-laws.
- D15.3 The Contractor shall adhere to following environmental protection measures:
- D15.3.1 Materials Handling and Storage

- (a) Storage of construction materials and equipment will be confined within a fenced area or at a location approved by the Contract Administrator with environmental protection (e.g. silt fence) as appropriate.
- (b) Construction materials will not be deposited or stored on or near watercourses unless written acceptance from the Contract Administrator is received in advance.
- (c) Construction materials and debris will be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

#### D15.3.2 Fuel Handling and Storage

- (a) The Contractor shall obtain all necessary permits from Manitoba Sustainable Development for the handling and storage of fuel products and shall provide copies to the Contract Administrator.
- (b) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products and Allied Products Regulation and any local land use permits.
- (c) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.
- (d) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervious material. If this type of material is not available, the dyke shall be constructed of locally available material and lined with high-density polyethylene (HDPE). Furthermore, the fuel storage area(s) shall be secured by a barrier such as a high fence and gate to prevent vandalism.
- (e) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.
- (f) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.
- (g) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.
- (h) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.
- (i) The area around storage sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.
- (j) The deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act, 1985. The Contractor shall take appropriate precautions to ensure that potentially deleterious substances (such as fuel, hydraulic fluids, oil, sediment, etc.) do not enter any water body.
- (k) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available on short notice.
- (l) Machinery shall arrive on Site in a clean condition and shall be maintained to be free to fluid leaks.
- (m) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available upon short notice. Additionally, appropriate

staff on Site shall be trained for proper handling of deleterious liquids (i.e. fueling) and trained in preventing and cleaning up minor spills.

#### D15.3.3 Waste Handling and Disposal

- (a) The construction area shall be kept clean and orderly at all times during and at completion of construction.
- (b) At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction Site, other than at a dedicated storage area as may be approved by the Contract Administrator.
- (c) The Contractor shall, during and at the completion of construction, clean-up the construction area and all resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Manitoba Regulation 150/91. Exceptions are liquid industrial and hazardous wastes which require special disposal methods (refer to Section 30.5D).
- (d) On Site volumes of sewage and/or septage will be removed on a weekly basis.
- (e) The Contractor shall ensure sewage, septage, and other liquid wastes generated on Site are handled and disposed of by a certified disposal contractor.
- (f) Indiscriminate dumping, littering, or abandonment shall not take place.
- (g) No on-site burning of waste is permitted.
- (h) Structurally unsuitable site excavation material will be removed by the Contractor.
- (i) Waste storage areas shall not be located so as to block natural drainage.
- (j) Runoff from a waste storage area shall not be allowed to cause siltation of a watercourse.
- (k) Waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.
- (l) Equipment shall not be cleaned near watercourses; contaminated water from onshore cleaning operations shall not be permitted to enter watercourses.
- (m) The Contractor shall notify and receive written approval from the Contract Administrator prior to discharge from any dewatered areas. The discharge will be released into a well-vegetated area, filter bag, settling basin, or storm sewer system to remove the suspended material and other deleterious substances from the discharge before it finds its way into any watercourse. Discharge from dewatering areas may require approved disposal via the sanitary sewer system or disposal truck in accordance with Construction Specifications, at the request of the Contract Administrator.
- (n) Flows will be dissipated so that dewatering discharges minimize erosion at the discharge point.

#### D15.3.4 Emergency Response

- (a) The Contractor shall ensure that due care and caution is taken to prevent spills.
- (b) The Contractor shall report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table 1 below) to Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 945-4888.
- (c) The Contractor shall designate a qualified supervisor as the on-Site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.
- (d) The following actions shall be taken by the person in charge of the spilled material or the first person(s) arriving at the scene of a hazardous material accident or the on-site emergency response coordinator:
  - (i) Notify emergency-response coordinator of the accident:

- ◆ Identify exact location and time of accident;
  - ◆ Indicate injuries, if any;
  - ◆ Request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup).
- (ii) Attend to public safety:
- ◆ Stop traffic, roadblock/cordon off the immediate danger area;
  - ◆ Eliminate ignition sources;
  - ◆ Initiate evacuation procedures if necessary.
- (iii) Assess situation and gather information on the status of the situation, noting:
- ◆ Personnel on Site;
  - ◆ Cause and effect of spill;
  - ◆ Estimated extent of damage;
  - ◆ Amount and type of material involved; and
  - ◆ Proximity to waterways, sewers, and manholes.
- (iv) If safe to do so, try to stop the dispersion or flow of spill material
- ◆ Approach from upwind;
  - ◆ Stop or reduce leak if safe to do so;
  - ◆ Dyke spill material with dry, inert absorbent material or dry clay soil or sand;
  - ◆ Prevent spill material from entering waterways and utilities by dyking;
  - ◆ Prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking; and
  - ◆ Resume any effective action to contain, clean up, or stop the flow of the spilled product.
- (e) The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to Manitoba Environment according to The Dangerous goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.
- (f) When dangerous goods are used on Site, materials for containment and cleanup of spill material (e.g. absorbent materials, plastic oil booms, and oversized recovery drums) shall be available on Site.
- (g) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to within-house resources without formal notification to Manitoba Environment.
- (h) City Emergency response, 9-1-1, shall be used if other means are not available.

#### D15.3.5

##### Erosion Control

- (a) The Contractor shall develop a sediment control plan prior to commencing Work to the satisfaction of the Contract Administrator.
- (b) The Contractor shall be responsible for inspecting and maintaining all erosion and sediment control structures.
- (c) Effective sediment control measures will be used during construction and until landscaping work has been completed to prevent sediment runoff from entering wetlands and other water courses.
- (d) Sediment control fencing, or other such erosion control structures, shall be employed wherever construction activity increases the potential for runoff to carry sediment into a drainage channel or other watercourse. The Contractor shall inspect all such structures daily during heavy construction activity in the areas of the structures and after a heavy rainfall to ensure their continued integrity.

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

D15.3.6 Runoff Control

- (a) Measures will be undertaken to ensure that runoff containing suspended soil particles is minimized from entering the land drainage system to the extent possible to the satisfaction of the Contract Administrator.
- (b) Soil and fill shall not be stockpiled on immediate watercourse bank areas. Stockpile locations shall be presented for review and approval to the Contract Administrator.
- (c) Areas that are heavily disturbed and vulnerable to erosion or gullyng will be diked to redirect surface runoff around the area prior to spring runoff.

D15.3.7 Migratory Birds and Wildlife

- (a) The Contractor shall follow all protection and mitigation measures under the federal Species At Risk Act (SARA), Migratory Birds Convention Act, and the Wildlife Act.
- (b) The clearing of trees, or shrubs shall be prohibited between **April 15 and September 30** of any year to protect nesting and breeding season for migratory birds.
- (c) The Contractor shall not disturb, move, or destroy migratory bird's nest in the Work area.

D15.3.8 Wetlands

- (a) The Contractor shall implement the following environmental protection measures to prevent the new loss of wetland functions, in accordance with the Federal Policy on Wetland Conservation.
- (b) The Contractor shall clearly mark wetland limits near the construction footprint prior to commencement of the Work and will remain marked throughout the construction period.
- (c) Wetlands shall not be disturbed without written permission from the Contract Administrator.
- (d) The Contractor shall maintain a minimum of five (5) meter buffer between the wetland and work area. Storage/parking of materials, equipment will be prohibited within five (5) meters of the wetland.

D15.3.9 Heritage Resources

- (a) If heritage material or human remains are discovered during the construction and soil removal process, all Work shall cease immediately and the Contractor shall immediately contact the Contract Administrator. The Historic Resource Branch and Winnipeg Police (if necessary) will be contacted by the Contract Administrator to determine the nature and extent of the archaeological material and to arrange for its safe recovery.
- (b) The Contractor shall be prepared for lost production while the Archaeologist investigates the finding(s) and determines its heritage value.
- (c) The Contractor shall not resume Work unless authorized by the Historic Resources Branch or Winnipeg Police.

## SCHEDULE OF WORK

### D16. COMMENCEMENT

- D16.1 The Contractor shall not commence any Work until he/she is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

- D16.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
    - (i) evidence of authority to carry on business specified in D9;
    - (ii) evidence of the workers compensation coverage specified in C6.15;
    - (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
    - (iv) the Safe Work Plan specified in D10;
    - (v) evidence of the insurance specified in D11;
    - (vi) the performance security specified in D12;
    - (vii) the subcontractor list specified in D13;
    - (viii) the detailed work schedule specified in D14.; and
    - (ix) the environmental protection plan specified in D15.
  - (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.

D16.3 The Contractor shall commence the Work on the Site within five (5) Working Days of receipt of the letter of intent.

D16.4 The City intends to award this Contract by April 2, 2018.

#### **D17. RESTRICTED WORK HOURS**

D17.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

#### **D18. WORK BY OTHERS**

- D18.1 Work by others on or near the Site will include but not necessarily be limited to:
- (a) City of Winnipeg Traffic Signals Branch – City of Winnipeg Traffic Signals Branch will be relocating signals and installing half bike signals at the intersection of Main Street and Chief Peguis Trail. The Contractor is expected to cooperate with the City of Winnipeg to facilitate construction.
  - (b) Winnipeg Transit – There are various bus stops located within the project limit. The Contractor can in no way disrupt Winnipeg Transit Services without written approval from Contract Administrator. The Contractor is expected to cooperate with Winnipeg Transit to facilitate construction;
  - (c) City of Winnipeg Water and Waste Department – The City of Winnipeg Water and Waste Department will be constructing a new interceptor sewer river crossing across the Red River as part of Northeast Sewer River Crossing (Bid Opportunity 1136-2017B). The construction of river crossing is anticipated to commence in October 2018. Construction activity will be strictly prohibited between October 1, 2018 and May 1, 2019, at laydown areas identified in the design drawings or identified by the Contract Administrator. Storage, parking of materials and equipment or vehicles will not be permitted. The Contractor is expected to cooperate with the City of Winnipeg and their designate to facilitate construction.
  - (d) Manitoba Hydro – Manitoba Hydro will be installing pedestrian decorative lighting from Main Street to Henderson Highway. The Contractor is expected to cooperate with Manitoba Hydro to facilitate construction.
  - (e) Manitoba Hydro – Manitoba Hydro will be relocating a guy wire for a high-voltage hydro pole located just north of 60 Whellems Lane. The Contractor is expected to cooperate with Manitoba Hydro to facilitate construction.

- (f) Lafarge Holcim – Lafarge Holcim will be supplying Portable Precast Concrete Barrier (TL-4 Barriers). The Contractor is expected to coordinate with Lafarge Holcim to facilitate pick up.
- (g) City of Winnipeg Traffic Services Department – The City of Winnipeg Traffic Services Department will be providing necessary regulatory signs for traffic control. The Contractor is expected to cooperate with the City of Winnipeg to facilitate construction.
- (h) City of Winnipeg Traffic Services Department – The City of Winnipeg Traffic Services Department will be supplying new overhead sign panel. The Contractor is expected to cooperate with the City of Winnipeg to facilitate construction.

## **D19. ENCROACHMENT ON PRIVATE PROPERTY**

D19.1 Further to Section 3.11 of CW 3110 of the General Requirements, the Contractor shall confine their Work to the public right-of-ways and construction easements at all times, except if he has received written permission from the property owner. The Contractor shall provide the Contract Administrator with a copy of any written permission he has received to enter onto private property.

## **D20. SEQUENCE OF WORK**

D20.1 Further to C6.1, the sequence of work shall be as follows:

D20.1.1 The Work shall be divided into four (4) Phases. Each Phase shall be subdivided into stages. Stages are further subdivided into major items of work.

D20.1.2 Drawing No's. 17M-02091-00-SK-01 to 17M-02091-00-SK-08 illustrate the following Phases and identifies **approximate** construction limits for each Phases.

D20.1.3 **Phase I** – Tree Removal, Kildonan Settlers Bridge barrier installation, pathway construction, existing stair modification and under bridge lighting installation - Refer to Drawing No's. 17M-02091-00-SK-01 and 17M-02091-00-SK-02 for approximate construction limits.

(a) **Stage 1** – Tree Removal for all pathway to be constructed as part of this Bid Opportunity in accordance with D15 "Environmental Protection Plan" and E19 "Bird Migratory Season".

- (i) Protection of existing trees;
- (ii) Removal of trees; and
- (iii) Clearing and grubbing.

(b) **Stage 2** – Structural Work

- (i) Implement traffic control and management;
- (ii) Structural concrete removals;
- (iii) Structural concrete removals using hydro-demolition method;
- (iv) Precast concrete traffic barrier delivery and installation;
- (v) Installation of crash attenuators.
- (vi) Installation of new bridge barrier; and
- (vii) Extension of existing staircase.

(c) **Stage 3** – Active Transportation Corridor and Corridor Amenities

- (i) Implementation and maintenance of erosion control measures;
- (ii) Common excavation;
- (iii) Installation of catch basins and corrugated steel culverts;
- (iv) Placement of sub-base and base course material;
- (v) Construction of 3.5m Type 1A Asphalt pathway;
- (vi) Construction concrete retaining wall with 4.0m concrete pathway;
- (vii) Installation of drain tiles;

- (viii) Construction of swale/ditch;
  - (ix) Removal and salvaging existing aluminum balanced barrier;
  - (x) Installation of aluminum balanced barrier and bridge aluminum balanced barrier;
  - (xi) Boulevard/slope grading;
  - (xii) Tree planting and soft landscaping; and
  - (xiii) Installation of site furniture.
- (d) **Stage 4 - Pedestrian Lighting and Associated Works**
- (i) Connecting to existing panel board;
  - (ii) Placement of utility conduits; and
  - (iii) Kildonan Settlers Bridge Luminaire installation.

D20.1.4 Further to D20.1.3, the Contractor may work on listed Phase I Stages concurrently.

D20.1.5 Immediately following the completion Phase I, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other Contractors.

D20.1.6 **Phase II** – Kildonan Settlers Bridge sidewalk widening, pathway construction and Frog Plain Park pedestrian lighting installation - Refer to Drawing No's. 17M-02091-00-SK-03 and 17M-02091-00-SK-04 for approximate construction limits.

(a) **Stage 1 – Structural Work**

- (i) Implement traffic control and management;
- (ii) Precast concrete traffic barrier delivery and installation;
- (iii) Hydro-demolition of existing bridge deck; and
- (iv) Installation of Bridge Barrier.

(b) **Stage 2 – Active Transportation Corridor and Corridor Amenities**

- (i) Implementation and maintenance of erosion control measures;
- (ii) Common excavation;
- (iii) Installation of catch basins and corrugated steel culverts;
- (iv) Placement of sub-base and base course material;
- (v) Construction of 3.5m Type 1A Asphalt pathway;
- (vi) Construction concrete retaining wall with 4.0m concrete pathway;
- (vii) Installation of drain tiles;
- (viii) Construction of swale/ditch;
- (ix) Boulevard/slope grading;
- (x) Tree planting and soft landscaping; and
- (xi) Installation of site furniture.

(c) **Stage 3 - Pedestrian Lighting and Associated Works**

- (i) Installation of cast-in-place concrete pile;
- (ii) Installation of waterproof panel board;
- (iii) Placement of utility conduits; and
- (iv) Installation of pedestrian lighting.

D20.1.7 Further to D20.1.6, the Contractor may work on Phase II Stages concurrently.

D20.1.8 Immediately following the completion of Phase II, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other Contractors.

D20.1.9 **Phase III** – Chief Peguis Trail and Main Street Intersection Improvement

- (a) **Stage 1** – Construction of Main Street left turn lane and Chief Peguis Trail median reconstruction - Refer to Drawing No. 17M-02091-00-SK-05 for approximate construction limits.
- (i) Concrete pavement removal;
  - (ii) Miscellaneous concrete removal;
  - (iii) Excavation;
  - (iv) Placement of geotextile fabric;
  - (v) Placement of sub-base and base course material;
  - (vi) Installation of dowel assemblies;
  - (vii) Construction of 230mm concrete pavement (Plain Dowelled);
  - (viii) Placement of Type 1A Asphalt Overlay (50mm);
  - (ix) Removal and salvaging existing aluminum balanced barrier;
  - (x) Removal of existing overhead structure; and
  - (xi) Abandoning existing overhead structure foundation;
- (b) **Stage 2** – Construction of Main Street safety curb and installation of overhead sign structure - Refer to Drawing No. 17M-02091-00-SK-06
- (i) Construction of median safety curb;
  - (ii) Installation of new overhead sign structure foundation; and
  - (iii) Installation of new cantilever overhead sign structure.
- (c) **Stage 3** – Construction of right turn cut-off lane and construction of south-east interlocking paving stone median with concrete sidewalk and multi-use pathway - Refer to Drawing No. 17M-02091-00-SK-07 for approximate construction limits .
- (i) Concrete pavement removal;
  - (ii) Sidewalk removal;
  - (iii) Miscellaneous concrete removal;
  - (iv) Excavation;
  - (v) Installation of catch basins and connection pipe;
  - (vi) Installation of subdrains;
  - (vii) Placement of utility conduits;
  - (viii) Placement of geotextile fabric;
  - (ix) Placement of sub-base and base course material;
  - (x) Installation of dowel assemblies;
  - (xi) Construction of 230mm concrete pavement (Plain Dowelled);
  - (xii) Construction of 180mm barrier or modified curb;
  - (xiii) Placement of Type 1A Asphalt Overlay (50mm);
  - (xiv) Construction of splash strip;
  - (xv) Installation of 100mm sidewalk with concrete blockouts;
  - (xvi) Installation of interlocking paving stones; and
  - (xvii) Installation of coloured bike lane.
- (d) **Stage 4** – Construction of north-east interlocking paving stone median with concrete sidewalk and multi-use pathway - Refer to Drawing No. 17M-02091-00-SK-08 for approximate construction limits.
- (i) Concrete pavement removal;
  - (ii) Sidewalk removal;
  - (iii) Miscellaneous concrete removal;
  - (iv) Excavation;
  - (v) Placement of sub-base and base course material;
  - (vi) Construction of 180mm barrier or modified curb;

- (vii) Construction of splash strip;
- (viii) Installation of 150mm reinforced bus pad with concrete blockouts;
- (ix) Installation of 100mm sidewalk with concrete blockouts; and
- (x) Installation of interlocking paving stones.

**D20.1.10 Phase IV – Remaining pathway construction**

- (a) Stage 1** – Pathways east of Kildonan Settlers Bridge
- (b) Stage 2** – Pathways west of Kildonan Settlers Bridge

**D20.1.11 Construction activity will be strictly prohibited between October 1, 2018 and May 1, 2019 at areas identified as “Sewer Contractor Laydown Area” as specified in Drawings 17M-02091-00-C11 and 17M-02091-00-C20. Storage/parking of materials, equipment or vehicles will not be permitted between these times, to accommodate the Northeast Sewer Interceptor Crossing Work (by Others, Bid Opportunity 1136-2017B). 36**

D20.1.12 The Contractor must complete all work outlined in Phase I prior to commencing Phase II.

D20.1.13 Further to D20.1.9, the Contractor may commence work outlined in Phase III concurrently with Phase I and/or Phase II. The Contractor shall complete Phase III Stages 1 through to Stage 4 sequentially.

D20.1.14 Immediately following the completion of the asphaltic concrete works of Phase III, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other Contractors.

D20.1.15 Placement of topsoil and finished grading of all boulevard shall be completed once the pathway construction and decorative pedestrian lights have been installed.

**D21. CRITICAL STAGES**

D21.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) Complete **Phase I - Stage 1** as specified in D20.1.3 by April 14, 2018 (**see D15.3.7, “Environmental Protection Plan - Migratory Birds and Wildlife”** for clearing and grubbing and tree removal requirements).
- (b) Complete **Phase I** specified in D20.1.3 by June 15, 2018.
- (c) Complete **Phase II - Stage 1** as specified in D20.1.6 by July 30, 2018.
- (d) Complete **Phase II - Stage 2 and Stage 3** as specified in D20.1.6 by September 28, 2018.
- (e) Complete **Phase III** as specified in D20.1.9 by September 28, 2018.
- (f) Complete **Phase IV** as specified in D20.1.10 by June 14, 2019.

D21.2 When the Contractor considers the Work associated with D21.1 to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

**D22. SUBSTANTIAL PERFORMANCE**

D22.1 The Contractor shall achieve Substantial Performance by September 28, 2018.

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

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

### **D23. TOTAL PERFORMANCE**

D23.1 The Contractor shall achieve Total Performance by June 14, 2019.

D23.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D23.3 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.

### **D24. LIQUIDATED DAMAGES**

D24.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

- (a) Critical Stage D21.1(b) – Three thousand five hundred dollars (\$3,500.00);
- (b) Critical Stage D21.1(c) – Three thousand five hundred dollars (\$3,500.00);
- (c) Substantial Performance – Three thousand five hundred dollars (\$3,500.00);
- (d) Total Performance – Two thousand dollars (\$2,000.00).

D24.2 The amounts specified for liquidated damages in D24.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D24.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

### **D25. SCHEDULED MAINTENANCE**

D25.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

- (a) Sodding maintenance as specified in CW 3510-R9;
- (b) Seeding maintenance as specified in CW 3520-R7;
- (c) Reflective crack maintenance as specified in CW 3520-R7.
- (d) Landscape Maintenance as specified in E50.

D25.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

## **CONTROL OF WORK**

### **D26. JOB MEETINGS**

- D26.1 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.
- D26.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

### **D27. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)**

- D27.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

### **D28. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS**

- D28.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

## **MEASUREMENT AND PAYMENT**

### **D29. PAYMENT**

- D29.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

### **D30. WARRANTY**

- D30.1 Notwithstanding C13.2, the warranty period shall begin on the date of Substantial Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

**FORM H1: PERFORMANCE BOND**  
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

\_\_\_\_\_ ,  
(hereinafter called the "Principal"), and

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

\_\_\_\_\_ dollars (\$\_\_\_\_\_)

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

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

BID OPPORTUNITY NO. 4-2018

CHIEF PEGUIS GREENWAY EXTENSION – Frog Plain Way to Henderson Highway  
which is by reference made part hereof and is hereinafter referred to as the "Contract".

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

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

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

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

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

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

**SIGNED AND SEALED**  
in the presence of:

\_\_\_\_\_  
(Witness as to Principal if no seal)

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

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

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

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

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

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

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

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

RE: PERFORMANCE SECURITY – BID OPPORTUNITY NO. 4-2018

CHIEF PEGUIS GREENWAY EXTENSION – Frog Plain Way to Henderson Highway

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

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

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

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

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

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

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

Partial drawings are permitted.

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

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

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

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

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

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

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

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

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

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

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

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

**FORM J: SUBCONTRACTOR LIST**  
 (See D13)

CHIEF PEGUIS GREENWAY EXTENSION – Frog Plain Way to Henderson Highway

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
<b>Supply of Materials</b>		
Concrete		
Asphalt		
Fill Material		
Erosion Control Measures		
Base Course & Sub Base		
Underground Materials (Catch Basin, CSP Culvert, etc.)		
Paving Stone		
Structural Steel		
Pedestrian Lighting Luminaires		
Overhead Sign Structure		
Electrical Panel		
<b>Installation/Placement</b>		
Concrete		
Asphalt		
Fill Material		
Erosion Control Measures		
Base Course & Sub Base		
Underground Materials (Catch Basin, CSP Culvert, etc.)		
Paving Stone		
Structural Steel		
Pedestrian Lighting Luminaires		
Electrical Panel		
Overhead Sign Structure and Sign Panel		

## PART E - SPECIFICATIONS

### GENERAL

#### E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
17M-02091-00-C-00	Cover Sheet <b>Transportation</b>	A1
17M-02091-00-C-01	West Side STA. 1+000 To STA. 1+150	A1
17M-02091-00-C-02	West Side STA. 1+150 To STA. 1+300	A1
17M-02091-00-C-03	West Side STA. 1+300 To STA. 1+444.15	A1
17M-02091-00-C-04	West Side STA. 2+000 To STA. 2+150	A1
17M-02091-00-C-05	West Side STA. 2+150 To STA. 2+273.40	A1
17M-02091-00-C-06	West Side STA. 3+000 To STA. 3+068.04	A1
17M-02091-00-C-07	West Side STA. 4+000 To STA. 4+150	A1
17M-02091-00-C-08	West Side STA. 4+150 To STA. 4+232.39	A1
17M-02091-00-C-09	West Side STA. 5+000 To STA. 5+150	A1
17M-02091-00-C-10	West Side STA. 5+150 To STA. 5+244.15	A1
17M-02091-00-C-11	West Side STA. 6+000 To STA. 6+138.68	A1
17M-02091-00-C-12	East Side STA. 7+000 To STA. 7+150	A1
17M-02091-00-C-13	East Side STA. 7+150 To STA. 7+300	A1
17M-02091-00-C-14	East Side STA. 7+300 To STA. 7+450	A1
17M-02091-00-C-15	East Side STA. 7+450 To STA. 7+600	A1
17M-02091-00-C-16	East Side STA. 7+600 To STA. 7+750	A1
17M-02091-00-C-17	East Side STA. 7+750 To STA. 7+877.15	A1
17M-02091-00-C-18	East Side STA. 8+000 To STA. 8+150	A1
17M-02091-00-C-19	East Side STA. 8+150 To STA. 8+300	A1
17M-02091-00-C-20	East Side STA. 8+300 To STA. 8+380.15	A1
17M-02091-00-C-21	East Side STA. 9+000 To STA. 9+069	A1
17M-02091-00-C-22	Guardrail Layout	A1
17M-02091-00-C-23	Guardrail Details (1 of 2)	A1
17M-02091-00-C-24	Guardrail Details (2 of 2)	A1
17M-02091-00-C-25	Main Street Intersection Improvement – Horiz. Geometry	A1
17M-02091-00-C-26	Main Street Intersection Improvement – Plan & Details	A1
	<b>Construction Staging</b>	
17M-02091-00-CS-01	Staging Plan – West Side Phase 1	A1
17M-02091-00-CS-02	Staging Plan – East Side Phase 1	A1
17M-02091-00-CS-03	Staging Plan – West Side Phase 2	A1
17M-02091-00-CS-04	Staging Plan – East Side Phase 2	A1
17M-02091-00-CS-05	Staging Plan – Intersection Improvement – Stage 1	A1
17M-02091-00-CS-06	Staging Plan – Intersection Improvement – Stage 2	A1

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
17M-02091-00-CS-07	Staging Plan – Intersection Improvement – Stage 3	A1
17M-02091-00-CS-08	Staging Plan – Intersection Improvement – Stage 4	A1
	<b>Structural</b>	A1
17M-02091-00-S-01	Design Data And General Notes	A1
17M-02091-00-S-02	General Arrangement Plan And South Elevation	A1
17M-02091-00-S-03	Typical Sections And Major Work Items	A1
17M-02091-00-S-04	Construction Staging	A1
17M-02091-00-S-05	Deck Drain Details	A1
17M-02091-00-S-06	Traffic Barrier Details (Sheet 1 of 3)	A1
17M-02091-00-S-07	Traffic Barrier Details (Sheet 2 of 3)	A1
17M-02091-00-S-08	Traffic Barrier Details (Sheet 3 of 3)	A1
17M-02091-00-S-09	Existing Expansion Joint	A1
17M-02091-00-S-10	Proposed Expansion Joint	A1
17M-02091-00-S-11	Expansion Joint Details	A1
17M-02091-00-S-12	Handrail Modification Details (Sheet 1 of 3)	A1
17M-02091-00-S-13	Handrail Modification Details (Sheet 2 of 3)	A1
17M-02091-00-S-14	Handrail Modification Details (Sheet 3 of 3)	A1
17M-02091-00-S-15	Slope Paving Modification Plans And Elevations	A1
17M-02091-00-S-16	Slope Paving Modification Details (Sheet 1 of 2)	A1
17M-02091-00-S-17	Slope Paving Modification Details (Sheet 2 of 2)	A1
17M-02091-00-S-18	Concrete Stair Modification Details (Sheet 1 of 4)	A1
17M-02091-00-S-19	Concrete Stair Modification Details (Sheet 2 of 4)	A1
17M-02091-00-S-20	Concrete Stair Modification Details (Sheet 3 of 4)	A1
17M-02091-00-S-21	Concrete Stair Modification Details (Sheet 4 of 4)	A1
17M-02091-00-S-22	Bills of Material (Sheet 1 of 2)	A1
17M-02091-00-S-23	Bills of Material (Sheet 2 of 2)	A1
	<b>Overhead Sign Structure</b>	A1
17M-02091-00-S-24	Overhead Sign Structure (Sheet 1 of 3)	A1
17M-02091-00-S-25	Overhead Sign Structure (Sheet 2 of 3)	A1
17M-02091-00-S-26	Overhead Sign Structure (Sheet 3 of 3)	A1
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## **E2. GEOTECHNICAL REPORT**

- E2.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions. The geotechnical report is contained in Appendix 'A'.

### **E3. OFFICE FACILITIES**

- E3.1 The Contractor shall supply office facilities meeting the following requirements:
- (a) The field office shall be for the exclusive use of the Contract Administrator.
  - (b) The building shall be conveniently located near the site of the Work.
  - (c) The building shall have a minimum floor area of 25 square metres, a height of 2.4m with two windows for cross ventilation and a door entrance with a suitable lock.
  - (d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18°C or 24-25°C.
  - (e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.
  - (f) One refrigerator, approximately 5 ft<sup>3</sup> and one mid-size microwave shall be supplied by the Contractor;
  - (g) The building shall be furnished with one desk, one drafting table 3m x 1.2m, one stool, and a minimum of 8 chairs.
  - (h) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.
  - (i) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.
- E3.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.
- E3.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance is completed.
- E3.4 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.

### **E4. TRUCK WEIGHT LIMITS**

- E4.1 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.

### **E5. VERIFICATION OF WEIGHTS**

- E5.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.
- E5.1.1 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 scale 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; and
  - (d) Checking tare weights shown on delivery tickets against a current tare.

E5.2 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.

E5.2.1 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); and
- (d) The time and date of weighing.

E5.3 No charge shall be made to the City for and delays or loss of production caused by such inspection and verification

## **E6. MOBILIZATION AND DEMOBILIZATION**

E6.1 Description

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

E6.2 Scope of Work

- (a) The Work under this Specification shall include but not be limited to:
  - (i) mobilizing and demobilizing on-site Work facilities;
  - (ii) supplying, setting up, laying out, and removing site office facilities as detailed in E8;
  - (iii) supplying and installing secure fencing/gates for portions of the laydown areas the Contractor wishes to secure; and
  - (iv) maintaining and removing any access roadways as needed into the laydown areas;

E6.3 Materials

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

E6.4 Equipment

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

E6.5 Construction Methods

E6.5.1 Layout of On-Site Work Facilities

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

E6.5.2 Site Security

- (a) The Contractor has discretion on what areas of the site they wish to secure. This may include the Contractor's lay down area, material storage areas, and/or access roads. These areas may be fenced and gated for security and to discourage pedestrian entrance to construction areas and to control any potential hazard to the public,

particularly children. The Contractor shall not fence off areas where public traffic or pedestrians need to travel, such as open roadway lanes or sidewalks/bike paths.

**E6.5.3 Access Roadway**

- (a) The Contractor shall note the laydown areas available within each Phase/Stage of the work on the Staging Drawings referenced in E11. The access roadway shall not be constructed at the sewer contractor laydown areas specified in Contract Drawings.
- (b) When the Contractor wishes to install an access along a laydown border marked "Contractor Laydown Area – Access", they shall make a written request to the Contract Administrator before commencing construction. The Contract Administrator shall have two (2) Business Days to review and respond to the request.
- (c) The Contractor shall maintain any access roadway they install.
- (d) Upon completion of the Work, the area shall be restored to its original condition.

**E6.5.4 Restoration of Existing Facilities**

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

**E6.6 Measurement and Payment**

**E6.6.1 Mobilization and Demobilization**

- (a) "Mobilization and Demobilization" will not be measured. This Item of Work will be paid for at a percentage of the Contract Lump Sum Price, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator. These percentages shall be as follows:
  - (i) when Contract Administrator is satisfied that construction has commenced: thirty percent (30%);
  - (ii) during construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator: sixty percent (60%); and,
  - (iii) upon Total Performance: ten percent (10%).

**E7. MATERIALS SUPPLIED BY THE CITY**

E7.1 The City will supply the following material:

**E11.1.1 Material:**

- (a) 4200mm x 2135mm Overhead Sign Panel

**E8. DANGEROUS WORK CONDITIONS**

- E8.1 The Contractor shall be aware that inside the steel girders of Kildonan Settler Bridge and underground chambers are considered a confined space and shall follow the "Guidelines for confined Entry Work" as published by the Manitoba Workplace Safety and Health Division. Prior to the commencement of any work, the Contractor shall submit a Safety and Health – Safe Work Plan to the Contract Administrator for review and acceptance by the City.
- E8.2 The Contractor shall be aware of the potential hazards that can be encountered in gate chambers, manholes and sewers such as explosive gases, toxic gases and oxygen deficiency.
- E8.3 The air in a confined space must be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases must be explosion-proof and equipped with a visible and audible alarm. The principal tests are for oxygen deficiency, explosion range and toxic gases. Testing equipment must be calibrated in accordance with manufacturer's specifications.

- E8.4 The Contractor shall ventilate all confined spaces including underground chambers, tunnels, pipes and shafts as required and approved by the Manitoba Workplace Safety and Health Act (the "Act"). If no ventilation is supplied, a Worker must wear a respirator or supplied air to enter the confined space.
- E8.5 If products containing volatile organic carbons (VOCs) are used, the Contractor shall provide a photoionization detector (PID) on Site to monitor potential VOCs in the confined spaces. The gas detector and safety equipment conforming to the Act shall be made available to the Contract Administrator for his use during inspections. In addition, the Contract Administrator may collect discrete air samples for laboratory analysis.
- E8.6 The Contract Administrator may issue a Stop Work order to the Contractor if the above guidelines are not being followed. The Contractor shall not resume his operations until the Contract Administrator is satisfied the Contractor is following the appropriate procedures. The Contractor shall have no claim for extra time or costs due to the Stop Work order for not following these safety guidelines.

## **E9. SHOP DRAWINGS**

### **E9.1 Description**

- (a) This Specification shall revise, amend and supplement the requirements of CW1110.
- (i) The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, including site erection drawings which are to be provided by the Contractor to illustrate details of a portion of the work.
  - (ii) The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the metric equivalent shall also be on all submissions for Engineering review.
- (b) Shop Drawings
- (i) Original drawings are to be prepared by Contractor, Subcontractor, supplier, distributor, or manufacturer, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
  - (ii) Shop drawings for the following structural components shall bear the seal of a Professional Engineer registered to practice in the Province of Manitoba.
    - (a) Shoring;
    - (b) Reinforcing steel;
- (c) Contractor's Responsibilities
- (i) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
  - (ii) Verify:
    - (i) Field Measurements
    - (ii) Field Construction criteria
    - (iii) Catalogue numbers and similar data
  - (iii) Coordinate each submission with requirements of Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.
  - (iv) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents
  - (v) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless the Contract Administrator gives written acceptance of specified deviations.
  - (vi) Responsibility for errors and omissions in submission is not relieved by the Contract Administrator's review of submittals.

- (vii) The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on the previous submission.
  - (viii) After Contract Administrator's review and return of copies, distribute copies to subtrades as required.
  - (ix) Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the site of the work for use and reference of the Contract Administrator and Subcontractors.
- (d) Submission Requirements
- (i) Schedule submissions at least 7 Calendar days before dates reviewed submissions will be needed, and allow for a 7 Calendar day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.
  - (ii) Submit five (5) paper prints of shop drawings. The Contractor is advised that the Contract Administrator will retain three (3) copies of all submittals and return two (2) copies to the Contractor.
  - (iii) Accompany submissions with transmittal letter, containing:
    - (i) Date
    - (ii) Project title and Bid Opportunity Number
    - (iii) Contractor's name and address
    - (iv) Number of each shop drawing, product data and sample submitted
    - (v) Specification Section, Title, Number and Clause
    - (vi) Drawing Number and Detail/ Section Number
    - (vii) Other pertinent data
  - (iv) Submission shall Include:
    - (i) Date and revision dates.
    - (ii) Project title and Bid Opportunity number.
    - (iii) Name of:
      - (i) Contractor
      - (ii) Subcontractor
      - (iii) supplier
      - (iv) manufacturer
      - (v) separate detailer when pertinent
    - (iv) Identification of product of material.
    - (v) Relation to adjacent structure or materials.
    - (vi) Field dimensions, clearly identified as such.
    - (vii) Specification section name, number and clause number or drawing number and detail/section number.
    - (viii) Applicable standards, such as CSA or CGSB numbers.
    - (ix) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
- (e) Other Considerations
- (i) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
  - (ii) Material and equipment delivered to the site of the works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.
  - (iii) Incomplete shop drawing information will be considered as stipulated deductions or the purposes of progress payment certificates.

- (iv) No delay or cost claims will be allowed that arise because of delays in submission, re-submissions and review of shop drawings.

#### E9.2 Measurements and Payment

- (a) Preparation and submittal of Shop Drawings shall be considered incidental to the Works of this Contract and no measurement or payment will be made for this item.

### E10. TRAFFIC CONTROL

#### E10.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130:

- (a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.
- (b) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or subcontractor.

#### E10.2 Notwithstanding E10.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the **Traffic Services Branch of the City of Winnipeg** to place, maintain, and remove all **regulatory signs** and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

- (a) Parking restrictions,
- (b) Stopping restrictions,
- (c) Turn restrictions,
- (d) Diamond lane removal,
- (e) Full or directional closures on a Regional Street,
- (f) Traffic routed across a median,
- (g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.
- (h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

#### E10.2.1 An exception to E10.2 is the 'KEEP RIGHT/KEEP LEFT' sign (RB-25 / RB-25L) which shall be supplied, installed, and maintained by the Contractor at their own expense.

#### E10.2.2 Further to E10.2, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

### E11. TRAFFIC MANAGEMENT

#### E11.1 Further to clause 3.7 of CW 1130 and Drawing No's. 17M-02091-00-C-28 to 17M-02091-00-C-35 in E1.

#### E11.1.1 Single lane closures on intersecting and/or adjoining Regional Streets shall only be permitted during non-peak periods when required for construction activities when approved by the Traffic Management Branch. Storage/parking of materials, equipment or vehicles is not permitted on Regional Streets at any time unless approved by the Contract

Administrator, in consultation with the Traffic Management Branch. When no work is being performed on site non-essential lane closures will not be permitted.

- E11.1.2 Following restrictions shall be met for all Phases specified in D20 "Sequence of Work".
- (a) Maintain a minimum of two lanes of traffic eastbound on Chief Peguis Trail between Main Street and Henderson Highway at all times. Unless otherwise indicated by the Contract administrator.
  - (b) Maintain a minimum of two lanes of traffic westbound on Chief Peguis Trail between Main Street and Henderson Highway at all times. Unless otherwise indicated by the Contract Administrator.
  - (c) One westbound right turn lane onto northbound Main Street is to be maintained at all times.
  - (d) Maintain a minimum of two lanes of traffic northbound on Main Street during afternoon peak period (15:30 – 17:30). A minimum of one southbound left turn lane onto eastbound Chief Peguis Trail is to be maintained during afternoon peak period (15:30 – 17:30) as a separate left turn lane with a minimum 20m storage length utilizing left turn designation sign. Two northbound right turn lanes onto eastbound Chief Peguis Trail are to be maintained during afternoon peak period (15:30 – 17:30).
  - (e) Maintain a minimum of one lane of traffic northbound on Main Street during non-peak period. One southbound left turn lane onto eastbound Chief Peguis Trail is to be maintained during non-peak period. One northbound right turn lane onto eastbound Chief Peguis Trail is to be maintained during non-peak period.
  - (f) Maintain a minimum two lanes of traffic southbound on Main Street at all times.
- E11.1.3 Single lane closures on Chief Peguis Trail shall only be permitted during non-peak periods when required for construction activities when approved by the Traffic Management Branch.
- E11.1.4 No pavement drop-offs will be permitted overnight.
- E11.1.5 The Contractor is to provide two weeks' notice to the City and the Contract Administrator prior to commencing any construction activity so that any required regulatory and Designated Construction Zone (DCZ) signage can be prepared and coordinated.
- E11.1.6 Intersecting local street, median opening and private approach access shall be maintained at all times unless joint/slab repairs or planing/paving operations require temporary closure. Temporary closures are to be staggered such that consecutive intersections are not closed at the same time. Traffic on intersecting regional/collector streets (Henderson Highway) shall be maintained at all times as stated in E11.1.1 unless planing/paving operations require temporary complete closures. Temporary complete closures shall be no longer than 15 minutes during asphalt planing/paving operations and shall be completed during off peak hours.
- E11.1.7 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.
- E11.1.8 Pedestrian access between Henderson Highway and Main Street must be maintained on one side at all times. The use of existing sidewalk on Whellam's Lane is acceptable for maintaining pedestrian access during Phase I as specified in D20 "Sequence of Work".
- E11.1.9 Flag persons may be necessary to maintain the flow of traffic during certain work operations.
- E11.1.10 One pedestrian crossing in both the east-west direction and in the north-south direction must be maintained at the Chief Peguis Trail and Main Street intersection at all times.
- E11.1.11 Ambulance/emergency vehicle access must be maintained at all times.

## **E12. PEDESTRIAN SAFETY**

- E12.1 During the project, the Contractor shall ensure the proper signage is in place during the intersection construction to direct any pedestrians within the construction zone either around the construction or to the sidewalk on the opposite side of the street. The Contractor must also use proper signage, barricades and temporary fencing to protect and keep pedestrians safely away from all construction areas and open excavations to the satisfaction of the Contract Administrator. No measurement for payment shall be made for this work.
- E12.2 The Contractor shall ensure additional protection and signage is in place during the hydro-demolition as specified in E54. The Contractor shall provide proper protection measure to protect and keep pedestrians safely away from any hydro demolition activity to the satisfaction of the Contract Administrator. No measurement for payment shall be made for this work.

## **E13. WATER OBTAINED FROM THE CITY**

- E13.1 Further to clause 3.7 of CW 1120, latest edition, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-Law. Sewer charges will not be assessed for water obtained from a hydrant.

## **E14. SURFACE RESTORATIONS**

- E14.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

## **E15. TEMPORARY SURFACE RESTORATION AND MAINTENANCE**

- E15.1 Further to CW 1130, if the Contractor fails to maintain disturbed surfaces as directed and within the time period given by the Contract Administrator, the City or its designate may perform the work required and the cost may be deducted from payments owed.
- E15.2 The Contractor shall monitor and maintain temporarily restored surfaces as required until permanent restoration is complete.
- E15.3 If, in the opinion of the Contract Administrator, temporarily restored surfaces are not being adequately maintained or were not properly constructed and pose a danger to the public, maintenance or reconstruction will be done by the City forces with no advance notification to the Contractor.
- E15.4 Temporary Surface Restoration and Maintenance shall be considered incidental to the Works of this Contract and no separate payment will be made for this item.

## **E16. WATERWAY BY-LAW AND PERMITS**

- E16.1 The Contractor shall note that some portion of the Works fall within 107 metres (350 feet) of the regulated summer water level of the Red River and are therefore within the regulated area of the City pursuant to Waterway By-Law 5888/92. The Contract Administrator will apply and pay for the required Waterway Permits for the Work. The Contractor shall make himself aware of and adhere to all conditions imposed by the permits.
- E16.2 Under no circumstances will stockpiling of any material be permitted within 107 metres of the regulated summer water level of the Red River without the approval of the Contract Administrator.

## ACTIVE TRANSPORTATION CORRIDOR & CORRIDOR AMENITIES

### E17. PROTECTION OF EXISTING TREES

#### E17.1 Description

E17.1.1 This Specification shall cover the protection of existing tree stands and individual trees during construction. The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

#### E17.2 Construction Methods

E17.2.1 The Contractor will field-verify the presumed limits of work indicated on the Drawings, and flag all trees that require pruning or removal to facilitate the work, subject to the Contract Administrator's approval. Above ground clearance for overhanging branches in the work zone must be anticipated. No trees may be removed or pruned without written approval from the Contract Administrator.

E17.2.2 Trees within or adjacent to a construction area that are not approved for removal by the Contract Administrator must be protected during construction by means of a barrier surrounding a "Tree Protection Zone" described herein.

E17.2.3 No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.

E17.2.4 No City of Winnipeg tree or tree protected by a City of Winnipeg by-law may be removed without the written permission of the City of Winnipeg.

#### E17.3 Tree Protection Zone

E17.3.1 The following is a chart showing optimal distances for determining a Tree Protection Zone. Distances are to be measured from the outside edge of the tree base toward the drip line, and may be limited by an existing paved surface, provided that surface remains intact through the construction period.

E17.3.2 Some site conditions may dictate the need for a smaller Tree Protection Zone. The City of Winnipeg Urban Forestry Branch must be notified in these instances. Forestry will determine if the smaller TPZ is acceptable in the specific circumstance and advise of any additional tree protection or removal requirements.

#### E17.3.3 Table 1 – Tree Protection Zones

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

#### E17.4 Tree Protection Barriers

E17.4.1 Fenced enclosures shall be erected around individual trees and tree stands to keep crowns and branching structure clear from contact by equipment, materials, and activities; to preserve roots and soil condition in an intact and non-compacted state; and to identify the Tree Protection Zone in which no soil disturbance is permitted and activities are restricted, unless otherwise approved by the Contract Administrator.

- E17.4.2 Barrier Material: plastic UV stabilized, high density polyethylene web snow fence, international orange colour, 1.22 meter height, or approved equal.
- E17.4.3 Barrier Material Supports: rolled steel T-bar fence posts driven min. 600mm below grade.
- E17.4.4 Tree strapping material will be installed on individual trees, in accordance with CW1140, where Work will be completed within the Tree Protection Zone. Wood strapping material having a minimum thickness of 25mm and minimum length of 2440mm around tree trunks in a manner that will not harm the trees. Do not use nails or other fasteners that penetrate into trees. The width of strapping should suit the size of the tree being protected. Length of strapping may be reduced to suit tree being protected as approved by the Contract Administrator.
- E17.4.5 Tree protection barriers are to be erected prior to the commencement of any construction or grading activities on the site and are to remain in place throughout the entire duration of the project. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place.
- E17.4.6 All supports and bracing used to safely secure the barrier should be located outside the Tree Protection Zone. All supports and bracing should minimize damage to roots.
- E17.4.7 No grade change, storage of materials or equipment is permitted within this area. The tree protection barrier must not be removed without the written authorization of the City of Winnipeg.
- E17.5 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing trees:
- (a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
  - (b) Where authorized, operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
  - (c) Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Contact the Forestry Branch for consultation on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.
- E17.6 Root Protection, Cutting and Care
- E17.6.1 Avoid cutting roots. If root cutting appears to be necessary, obtain approval from the Contract Administrator before proceeding. If required and approved, root pruning must be performed under the direction of the Forestry Branch.
- E17.6.2 Cut roots cleanly with sharp, sterilized hand tools to promote quick wound closure and regeneration.
- E17.6.3 Minimize damage by avoiding excavation during hot, dry weather.
- E17.6.4 Keep protected plants well watered before and after digging.
- E17.6.5 Cover exposed roots with approved temporary root cover material such as soil, mulch, or damp burlap immediately after exposure. Temporary root covers shall be kept damp as long as they are in place.
- E17.7 American elm trees are not to be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.

- E17.8 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist licence or by the Forestry Branch.
- E17.9 The Forestry Branch will remove and replace any trees deemed to have died or that are dying due to damage from carelessness during construction. Removal and replacement costs will be determined by size, market price of the largest transplantable tree of same or different species and may include appraised value of existing tree as determined by current International Society of Arboriculture evaluation procedure presently used by Forestry Branch in conjunction with City Claims Branch. Estimated replacement cost of a 250 and 600mm diameter American elm on a boulevard based on an appraised value is approximately \$4,700.00 and \$27,000.00 respectively.
- E17.10 Measurement and Payment
- E17.10.1 Tree Protection will be measured on a linear meter basis and paid for at the Contract Unit price linear meter as "Tree Protection Fence" in accordance with this specification and accepted by the Contract Administrator.

## **E18. CLEARING AND GRUBBING**

### E18.1 Description

#### E18.1.1 General

- (a) This specification covers clearing and grubbing and removal of individual trees.
- (b) Referenced Standard Construction Specifications
- (c) CW3010 – Clearing and Grubbing.

#### E18.1.2 Definitions

- (a) Clearing consists of cutting off standing trees, brush and scrub at or close to existing grade and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- (b) Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than specified depth below existing ground surface.
- (c) Clearing and Grubbing Areas consist of clumps of standing trees, bush, scrub and surface debris.
- (d) Tree removal consist of individual trees larger than 200mm caliper in open grassed areas with no bush or scrub surrounding them.

#### E18.1.3 Protection

- (a) Protect existing trees and vegetation to remain as per 0 Protection of Existing Trees
- (b) Limit Site disturbance to:
- (c) 10m beyond the building perimeter;
- (d) 1.2m beyond multiuse pathways, ditches, and swales; and
- (e) Limits specified by the Contract Administrator.

### E18.2 Construction Methods

#### E18.2.1 Clearing

- (a) Clearing includes cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including felled trees, shrubs, scrub and rubbish occurring within cleared areas.

- (b) Clear as directed by the Contract Administrator, by cutting at or close to existing grade. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- (c) Cut off unsound branches on trees designated to remain as directed by the Contract Administrator.

E18.2.2 Grubbing

- (a) Grub out all stumps and roots from clearing and grubbing areas.
- (b) Grub out visible rock fragments and boulders.
- (c) Fill depressions made by grubbing with suitable fill material and to make new surface conform to existing adjacent ground surface.

E18.2.3 Tree Removal

- (a) Remove trees, including roots, as noted on construction drawings and as approved and directed by the Contract Administrator.
- (b) Fill depressions made by root removal with suitable fill material and to make new surface conform to existing adjacent ground surface.

E18.2.4 Removal and Disposal

- (a) Remove cleared and grubbed materials off site.

E18.3 Measurement and Payment

E18.4 Clearing and Grubbing will be measured on an area basis and paid for at the Contract Unit Price per hectare as "Clearing and Grubbing". The area to be paid for will be the total hectares of Clearing and Grubbing performed in accordance with this specification and accepted by the Contract Administrator.

E18.5 Removal of individual trees larger than 200 mm caliper in open grassed areas shall be measured on a per unit basis and paid for at the Contract Unit Price for "Tree Removal" measured as specified herein for the total number of individual trees removed in accordance with this Specification, accepted and measured by the Contract Administrator.

E18.6 Removal of individual trees smaller than 200 mm in caliper size shall be considered incidental to "Clearing and Grubbing". No measurement and payment will be made within this section.

**E19. BIRD MIGRATORY SEASON**

E19.1 In addition to the provisions outlined in D15, the Contractor shall provide mitigation measures to protect migratory birds. The contractor shall be prohibited to perform any clearing & grubbing and tree removal operation during the general nesting periods of migratory birds. The general nesting period in open field habitat is predicted to occur between **April 15 and September 30** at any year. The City reserves the right to impose any legal actions and momentary fines for works that are not in accordance to the requirements of this specification.

**E20. PRUNING OF EXISTING TREES**

E20.1 Description

E20.1.1 Provide all labour, materials, methods, equipment and accessories for pruning of existing trees within the limit of Work.

E20.2 Quality Assurance

E20.2.1 Pruning shall be provided by a person with a Manitoba Arborists Certificate with demonstrable experience sourcing and Work.

E20.2.2 Contact the City of Winnipeg Forestry Branch at 204-986-2004 to arrange an on site meeting to review trees to be pruned. Meeting to include the Contract Administrator.

**E20.3 Pruning Methodology**

- E20.3.1 Prune horizontal and vertical within the limits of construction to ensure construction equipment can be operated without interfering with trees to remain.
- E20.3.2 Prune as required to remove dead, broken or damaged limbs.
- E20.3.3 Prune back to healthy growth while maintaining balanced crown shape.
- E20.3.4 Employ clean sharp tools.
- E20.3.5 Make cuts smooth and flush with outer edge of branch collar near the main stem or branch.
- E20.3.6 Cuts must be smooth and sloping to prevent accumulation of water on cut.
- E20.3.7 Do not leave little stumps ("horns") on trunks or main branches.
- E20.3.8 Prune according to accepted horticultural practices as outline in "The Pruning Manual", Publication No. 1505-1977 by Agriculture Canada.

**E20.4 Measurement and Payment**

- E20.4.1 No payment shall be made for pruning of existing trees. Pruning of existing trees shall be considered incidental to the Work.

**E21. SUPPLY AND INSTALLATION OF MOISTURE BARRIER/STRESS ABSORPTION GEOTEXTILE FABRIC**

DESCRIPTION

**E21.1 General**

- E21.1.1 This specification covers the supply and installation of Moisture Barrier/Stress Absorption Geotextile.
- E21.1.2 Referenced Standard Construction Specifications
  - .1 CW 3130 – Supply and Installation of Geotextile Fabrics.
  - .2 CW 3410 – Asphaltic Concrete Pavement Works.

MATERIALS

**E21.2 Mill Certificate and Bill of Lading**

- E21.2.1 Provide mill certificate and bill of lading in accordance with Section 2 of CW 3130.

**E21.3 Storage and Handling**

- E21.3.1 Store and handle material in accordance with Section 2 of CW 3130.

**E21.4 Moisture Barrier/Stress Absorption Geotextile Fabric**

- E21.4.1 Geotextile fabric will be non-woven.
- E21.4.2 All physical property requirements are minimum average roll values determined in accordance with ASTM 4759. The moisture barrier/stress absorption geotextile fabric will meet or exceed the standards as follows:

PROPERTY	STANDARD	TEST METHOD
GrabTensile Strength	0.40 kN	ASTM D4632
Grab Elongation	50%	ASTM D4632
Mullen Burst	1240 Kpa	ASTM D3786

- E21.4.3 Acceptable products will be Amoco-petromat 4599, ARMTEC PF1, NILEX-9W99, Scaps GC-130.

## E21.5 Tack Coat

- E21.5.1 Tack coat will be 150 – 200 asphalt cement supplied in accordance with Clause 5.4.2 of CW 3410.

### CONSTRUCTION METHODS

## E21.6 General

- E21.6.1 Install moisture barrier/stress absorption geotextile fabric at the locations as shown on the Drawings or as directed by the Contract Administrator.
- E21.6.2 Proceed with installation upon completion and acceptance of the asphalt levelling course.
- E21.6.3 Ensure pavement surface is clean and free of all dirt, water, oil or foreign materials.
- E21.6.4 Apply tack coat with a distribution truck in accordance with manufacturer's specifications and recommendations. Ensure uniform coverage of entire pavement surface.
- E21.6.5 Install geotextile fabric in accordance with the manufacturer's specifications and recommendations.
- E21.6.6 Only construction equipment required to place the final asphalt surface course will be allowed to travel on the exposed geotextile fabric.
- E21.6.7 Replace damaged or improperly placed geotextile fabric.
- E21.6.8 All fabric installed must be covered with asphalt the same day.
- E21.6.9 Commence placement of asphalt material after the fabric has been placed over the full width of the pavement surface and accepted by the Contract Administrator.
- E21.6.10 Ensure temperature of asphalt material does not exceed the melting point of the fabric.

### MEASUREMENT AND PAYMENT

## E21.7 Moisture Barrier/Stress Absorption Geotextile Fabric

- E21.7.1 Supply and installation of Moisture Barrier/Stress Absorption Geotextile Fabric will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Moisture Barrier/Stress Absorption Geotextile Fabric". The area to be paid for will be the total number of square metres of geotextile fabric supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- E21.7.2 The supply and application of the tack coat will be included in the payment for "Moisture Barrier/Stress Absorption Geotextile Fabric".

## **E22. EROSION CONTROL BLANKET**

### E22.1 Description

- E22.1.1 This Specification shall cover supply and installation of erosion control blankets on exposed soils on the working platforms and access ramps, and other areas disturbed during construction.
- E22.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

### E22.2 Materials

#### E22.2.1 Erosion Control Blanket (ECB)

- (a) Erosion control blanket shall be machine produced 100% coconut fibre matrix with a functional longevity of up to 12 to 36 months.

- (b) The blanket shall be of consistent thickness with the coconut fibres evenly distributed over the entire area at a minimum of  $0.27 \pm$  kg of coconut fibre/m<sup>2</sup>.
- (c) Biodegradable reinforcement netting on both sides manufactured from heavy weight cotton or jute fibre thread. (1.47 kg/100m of thread). The mesh dimension shall be a 16 x 16 mm sewn together on 38 mm centres.
- (d) Approved products are:
  - (i) Erosion Control Blanket C32BD;
  - (ii) North American Green C125BN
- (e) The Contractor shall submit all manufacturers' product specifications and recommended installation methods for the proposed erosion control blankets.

### E22.3 Construction Methods

E22.3.1 Erosion Control Blanket (ECB) shall be installed over exposed unvegetated areas of the riverbank following completion of temporary access removal on the riverbank. The ECB shall be installed prior to rising river levels in the spring, following riverbank stabilization.

#### E22.3.2 ECB Installation

- (a) The Contractor shall follow the manufacturer's recommended installation procedure, as well as the following requirements.
- (b) Roll blanket out in direction of water flow (parallel to shoreline).
- (c) Securely fasten blanket against soil surface with a staggered staple pattern as per the manufacturer's recommendations and as accepted by the Contract Administrator.
- (d) At blanket edges overlap upstream blanket over downstream blanket by a minimum of 150 mm and secure overlaps.
- (e) The upstream edge of the blanket shall be secured in a 150 mm deep by 150 mm wide trench and anchored with staples at a maximum of 300 cm spacing. The trench shall be backfilled with compacted clay.

#### E22.3.3 ECB Maintenance

- (a) The areas covered with ECB shall be regularly inspected, and in particular after severe rainfall, or flooding events to check for blanket separation or breakage until the end of the warranty period or until vegetation growth has been established.
- (b) Any damage or poorly performing areas shall be replaced/repared immediately. Regrading of the slope by manual labour methods may be required in the event of rill or gully erosion.

### E22.4 Measurement and Payment

#### E22.4.1 Erosion Control Blanket

- (a) Erosion Control Blanket shall be measured on an area basis and paid for at the Contract Unit Price per square meter for "Erosion Control Blanket", which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, as accepted and measured by the Contract Administrator.
- (b) Areas requiring replacement as directed by the Contract Administrator will be re-measured and additionally paid for at the Contract Unit Price for the Work item. The Contractor shall be compensated for replacing ECB only if the damage occurred as a result of conditions beyond their control, such as severe run-off, or from ice or floating debris. The Contractor shall not be compensated for replacing or repairing ECB

## E23. SILT FENCING

### E23.1 Description

- (a) This Specification shall cover all operations relating to the work necessary for the supply, installation, and maintenance of silt fence barrier, as herein specified.
- (b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in D15, "Environmental Protection Plan".
- (c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

#### E23.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>);
  - (ii) ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics— Diaphragm Bursting Strength Tester Method;
  - (iii) ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus;
  - (iv) ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity;
  - (v) ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles;
  - (vi) ASTM D4632 – Grab Breaking Load and Elongation of Geotextiles;
  - (vii) ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile; and
  - (viii) ASTM D4833 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
  - (ix) CW 3550 – Chain Link and Drift Control Fence
- (b) The latest version of the City of Winnipeg Standard Construction Specifications
  - (i) CW 3550 – Chain Link and Drift Control Fence;

#### E23.3 Scope of Work

- (a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:
  - (i) Supplying and installing temporary silt fence barrier;
  - (ii) Maintaining silt fence barrier until final site restoration;
  - (iii) Removing silt fence barrier; and
  - (iv) Complying with all requirements outlined in D15, "Environmental Protection Plan".

#### E23.4 Submittals

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

#### E23.5 Materials

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

- (ii) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) Handling and Storage of Materials
  - (i) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) Fence Posts
  - (i) Fence posts shall be 38 mm x 38 mm untreated wood posts, 41 mm steel tee posts, or punched steel U posts, minimum length of 1.2 m.
- (d) Filter Fabric
  - (i) Filter fabric shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

<b>TABLE 14.1</b>		
<b>FILTER FABRIC REQUIREMENTS</b>		
<b>Property</b>	<b>Test Method</b>	<b>Value</b>
Grab Tensile Strength	ASTM D4632	0.55 kN
Grab Tensile Elongation	ASTM D4632	15%
Mullen Burst	ASTM D3786	2060 kPa
Puncture	ASTM D4833	0.285 kN
Trapezoid Tear	ASTM D4533	0.285 kN
UV Resistance	ASTM D4355	80% @ 500 hrs
Apparent Opening Size (AOS)	ASTM D4751	0.60 mm
Flow Rate	ASTM D4491	405 l/min/m <sup>2</sup>

- (ii) The fabric shall be inert to commonly encountered soil chemicals, hydrocarbons, mildew and bacteria.
- (e) Wire Mesh
  - (i) Wire mesh shall be galvanized or plain metal with 3.0 mm wire gauge and wire spacing at 150 mm o/c.
- (f) Fencing Material Fasteners
  - (i) Staples or wire ties of sufficient strength and spacing to withstand a 530 N (120 lbf) pull test at any point on the wire mesh.

**E23.6 Equipment**

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

**E23.7 Construction Methods**

- (a) General
  - (i) Silt fencing which should be installed at the start of the work, shall be installed along areas where there is stripped or exposed soil where run-off would enter the Truro Creek. Final locations of the silt fence barrier will be dependent upon site conditions and the Contractor's activities and methods, and may require adjustment.
  - (ii) Locations of silt fence barrier will be confirmed on site with the Contract Administrator.

- (iii) Work shall be undertaken in accordance with D15, "Environmental Protection Plan" to prevent deleterious substances from entering into wetlands.
- (b) Silt Fence Barrier Installation
  - (i) Excavate a 150 mm x 150 mm anchor trench along alignment of silt fence barrier.
  - (ii) Install fence posts in accordance with Manufacturer's recommended installation methods. Fence posts shall be firmly driven into undisturbed soil, or are completely and firmly backfilled if installed via auger methods.
  - (iii) Attach wire mesh as support backing for silt fence barrier filter fabric with specified fasteners. Attach silt fence barrier filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450 mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid within the anchor trench.
  - (iv) Install and compact impermeable excavated materials into anchor trench and slope as required. Compact to 95% of maximum dry density in accordance with ASTM D-698.
- (c) Silt Fence Barrier Maintenance
  - (i) Silt fence barrier shall be inspected daily and prior to commencing other construction activities.
  - (ii) All silt fences shall be inspected immediately after runoff event and at least daily during prolonged rainfall or runoff. Any required repairs shall be made immediately. The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through and under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging. Fence posts shall remain upright and shall not be loosely placed into the ground.
  - (iii) Accumulated sediment that is 300 mm or greater in depth shall be carefully removed and disposed of offsite without disturbing the silt fence barrier. Accumulated sediment shall also be removed as necessary to perform maintenance repairs. Accumulated sediment shall be removed immediately prior to removal of the silt fence barrier.
- (d) Silt Fence Barrier Removal
  - (i) Remove silt fences following completion of all site construction activities (including final restoration and cleanup) and after installation of all permanent erosion control measures and satisfactory establishment of permanent vegetation.
  - (ii) Restore areas disturbed, without releasing any deleterious substances to the adjacent watercourse.
- (e) Complying with Environmental Protection Requirements
  - (i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Truro Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D15, "Environmental Protection Plan"

#### E23.8 Quality Control

- (a) Inspection
  - (i) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
  - (ii) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

## E23.9 Measurement and Payment

### (a) Silt Fence Barrier

- (i) Supplying, installing, maintaining, and removing silt fence barrier shall be measured on a length basis and shall be paid for at the Contract Unit Price for "Supply and Install Silt Fence Barrier", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The length to be paid for shall be the total lineal metres of silt fence barrier supplied, installed, maintained, and removed in accordance with this Specification, and as accepted by the Contract Administrator.
- (ii) Payment for silt fence barrier shall be based on the following breakdown:
  - (i) Following supply and installation: 60%
  - (ii) Following final removal: 40%
- (iii) Removal of accumulated sediment from the silt fence shall be considered incidental to the Work and no separate measurement or payment shall be made.
- (iv) Temporary removal and reinstallation of the silt fence to facilitate other project activities such as revegetation shall be considered incidental to the Work and no separate measurement or payment shall be made.

## E24. REMOVAL OF EXISTING BOLLARDS

### E24.1 Description

E24.1.1 This specification shall cover the requirements for removal of existing bollards.

### E24.2 Construction Methods

E24.2.1 Remove bollards completely to a minimum of 200 mm below the surface elevation. The Contractor shall be responsible for backfilling any holes created through the removal of bollards. Holes are to be filled with suitable material or granular material, as accepted by the Contract Administrator.

### E24.3 Measurement and Payment

E24.3.1 Bollard removal shall be measured on a unit basis and will be paid for at the Contract Unit Price for "Removal of Bollards" which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E24.3.2 Backfilling holes created through the removal of bollards will be consider incidental to the work. No measurement or payment will be made for this work.

## E25. REMOVAL OF GRANUAR PATHWAY

### E25.1 Description

E25.1.1 This specification shall cover the requirements for removal of granular pathway.

### E25.2 Construction Methods

E25.2.1 Remove existing granular pathway, at locations as shown on the Drawings or as directed by the Contract Administrator. Remove all materials to a combined thickness of 200 mm, unless otherwise indicated in the Specifications.

E25.2.2 Utilize backhoe type equipment unless approved otherwise by the Contract Administrator.

E25.2.3 Dispose of material in accordance with Section 3.4 of CW 1130.

**E25.3 Measurement and Payment**

E25.3.1 Pavement removal will be measured on an area basis and paid for at the Contract Unit Price per square meter for the "Granular Pathway Removal". The area to be paid for will be the total number of square metres of existing pavement removed in accordance with this specification, accepted and measured by the Contract Administrator.

**E26. BENCH CUTS**

**E26.1 Description**

E26.1.1 This specification shall cover the requirements for bench cuts.

**E26.2 Construction Method**

E26.2.1 Bench cut stepped excavation to be completed as shown on drawings and / or as directed by contract administrator.

E26.2.2 Bench cuts shall consist of excavating horizontal cuts into the slopes of the existing embankment prior to placing widening material thereon. Bench cuts shall be made at vertical intervals of 1.0 m, with the base of the initial bench cut being approximately 0.5 m above the toe of the existing slope. The base of each bench cut shall extend into the existing slope a minimum of 2 m. Suitable material resulting from the bench cut shall be incorporated and compacted into the new embankment. Unsuitable material shall be disposed of as directed by the Contract Administrator.

E26.2.3 The Contractor shall ensure that the base of the bench cut is sufficiently stable to accommodate compaction of the first lift of fill thereon to a minimum of 95% AASHTO standard dry density

**E26.3 Measurement and Payment**

E26.3.1 Pavement removal will be measured on a linear meter basis and paid for at the Contract Unit Price per linear meter for the "Bench Cuts". The linear meter to be paid for will be the total number of linear metres of bench cuts performed in accordance with this specification, accepted and measured by the Contract Administrator.

E26.3.2 Embankment/subgrade compaction will be considered incidental to this work and no separate measurement or payment will be made.

**E27. CONCRETE SIDEWALK WITH BLOCK-OUTS FOR INTERLOCKING PAVING STONES**

**E27.1 Description**

E27.1.1 This specification shall cover the requirements for concrete sidewalk with block-outs for interlocking paving stones.

**E27.2 Construction Methods**

E27.2.1 Further to Specification CW 3325 the Contractor shall construct the proposed 100mm Concrete Sidewalk with Block-outs for Interlocking Paving Stones with a minimum 100mm depth of concrete below pavers. The "block-outs" shall be constructed utilizing forming techniques capable of accommodating the proposed paving stones to the dimensions and tolerances as confirmed with interlocking paving stone manufacturer.

E27.2.2 A 50mm levelling course of Base Course Material will be used for the 100mm Concrete Sidewalk with Block-outs for Interlocking Paving Stones.

E27.2.3 The concrete sidewalk shall be poured such that the "block-outs" and remaining sidewalk act as a monolithic section.

- E27.2.4 All costs in connection with the additional forming and placement of concrete as a result of the “block-outs”, shall be included in the Contract Unit Price for 100mm or 150mm Concrete Sidewalk with Block-outs for Interlocking Paving Stones.
- E27.2.5 Where concrete sidewalk is to be poured up to adjacent buildings, an approved bond breaker shall be supplied and installed from the base of the concrete slab up to the concrete surface. Cost of the bond breaker shall be included in the Contract Unit Price for 100mm Concrete Sidewalk with Block-outs for Interlocking Paving Stones.
- E27.2.6 Further to Specification CW 3110, the Contractor must use Granular Base Course material for all sidewalk installations and renewals within 5 m of existing boulevard trees. No limestone or crushed concrete base course material will be permitted when constructing sidewalk within 5 m of existing boulevard trees as directed and approved by the Contract Administrator.
- E27.3 Measurement and Payment
- E27.3.1 Construction of Concrete Sidewalk with Block-outs for Interlocking Paving Stones will be measured on an area basis and paid for at the Contract Unit Price per square metre for “100mm Sidewalk with Concrete Blockouts”. The area to be paid for will be the total number of square metres constructed of 100mm Sidewalk with Concrete Blockouts in accordance with this Specification, accepted and measured by the Contract administrator.
- E27.3.2 Construction of Concrete Sidewalk with Block-outs for Interlocking Paving Stones will be measured on an area basis and paid for at the Contract Unit Price per square metre for “150mm Sidewalk with Concrete Blockouts”. The area to be paid for will be the total number of square metres constructed of 150mm Sidewalk with Concrete Blockouts in accordance with this Specification, accepted and measured by the Contract administrator.
- E27.3.3 The supply, placement and compaction of Base Course Material for Concrete Sidewalk with Block-outs for Interlocking Paving Stones shall be included in the cost of Concrete Sidewalk with Block-outs for Interlocking Paving Stones and no separate measurement and payment will be made.

## **E28. PORTABLE PRECAST CONCRETE BARRIER**

- E28.1 Description
- E28.1.1 This Specification covers transportation, placement and assembly of portable precast concrete barriers.
- E28.1.2 The major components of the work under this Specification are as follows:
- (a) Transporting temporary portable precast concrete traffic barriers from Lafarge Holcim Canada’s yard (specified in E28.2.1(a)) to site.
  - (b) Placing and assembling portable precast concrete barriers.
  - (c) Dis-assembling, relocating and re-assembling portable precast concrete barriers on site.
  - (d) Dis-assembling and transporting portable precast concrete traffic barriers to the City of Winnipeg yard.
- E28.2 Materials
- E28.2.1 General
- (a) The precast concrete traffic barriers will be stored at a yard located at:  
Lafarge Holcim Canada  
185 Dawson Road North  
Winnipeg, MB R2J 0S6
  - (b) Each barrier weighs approximately 1965kg with exact dimensions specified in Appendix ‘E’ – Precast Concrete Portable Traffic Barrier.

#### E28.2.2 Procurement

- (a) The Portable Precast Concrete Traffic Barriers shall be picked up on an “as scheduled” basis. The Contractor shall be responsible for the safe storage and handling of barriers once the barriers have been loaded onto the truck.
- (b) The Contractor shall coordinate and schedule Portable Precast Concrete Traffic Barriers to be procured within twenty eight (28) Calendar Days following the scheduled supply dates:
  - (i) One hundred thirty (130) Portable Precast Traffic Barriers for March 19, 2018.
  - (ii) Additional seventy (70) Portable Precast Traffic Barriers for May 14, 2018.
- (c) The Contractor shall coordinate with a Lafarge Holcim personnel to facilitate pick-up date and time.
  - (i) Urbano Teixeira  
Work: 204-958-4893  
Project Manager  
Lafarge Holcim Canada  
Email:[urbano.teixeira@lafargeholcim.com](mailto:urbano.teixeira@lafargeholcim.com)
- (d) Lafarge Holcim Canada will be responsible for loading the Barriers onto the truck making the pick-up.
- (e) Notwithstanding E28.2.2(b), in the event that operational changes result in substantial changes to the requirement for the Barriers, the City reserves the right to a one-time change of the scheduled pick-up date. The City shall incur no cost or liability to the Contractor as a result of such event.
- (f) The Contractor shall notify Lafarge Holcim Canada at least seventy two (72) hours prior to pick up.

#### E28.2.3 Handling and Storage

- (a) The Contractor shall be responsible for transport, placement and storage of barriers from the procurement date until the barriers have been delivered to the City of Winnipeg yard, as specified in E28.2.7.
- (b) During handling and storage, the barriers shall be maintained in an upright position and shall be supported at the bearings areas. The barriers may be stacked two (2) barriers in height. Care shall be exercised during the handling and storage of the precast concrete barriers to avoid twisting, cracking or other distortion that may result in damage to the barriers.

#### E28.2.4 Loading, Transporting, Unloading and Stockpiling

- (a) During loading, transporting, unloading and stockpiling of the barriers, the Contractor shall be responsible for protecting the barriers at the restraint points.
- (b) Care shall be exercised during the loading, transporting, unloading and stockpiling of the precast concrete barriers to avoid twisting, cracking or other distortion that may result in damage to the barrier. The Contractor shall visually inspect the barriers once they have been loaded onto the truck making the pick-up. Extensive cracking of the barriers during these operations will be basis for rejection by the Contract Administrator.
- (c) Timber blocking (150 mm x 150 mm) shall be placed under the barriers at two (2) locations along the length as directed by the Contract Administrator.

#### E28.2.5 Installation

- (a) The barriers shall be installed in proper both vertical and horizontal alignment and properly connected to the satisfaction of the Contract Administrator.
- (b) The Contractor shall maintain and adjust barriers as required through the duration of the work.

#### E28.2.6 Relocation

- (a) The Contractor shall remove and relocate portable precast concrete barriers between Phase I and Phase II.
- (b) The Contractor shall be responsible for loading, transporting, handling, unloading and re-installing barriers as specified in E28.2.3, E28.2.4, and E28.2.5.

#### E28.2.7 Salvage

- (a) The Contractor shall be responsible for the salvage, delivery, unloading and stockpiling of the portable precast concrete barriers and all applicable components from Site to the City of Winnipeg Bridge Yard located at:

City of Winnipeg Bridge Yard  
960 Thomas Avenue  
Winnipeg, MB R2L 2E1

- (b) The Contractor shall contact the City of Winnipeg personnel to arrange suitable time and date of delivery.
  - (i) Michael Terleski, C.E.T  
Work: (204) 983-5004 or Mobile: (204) 794-8510  
Bridge Operations Technologist  
City of Winnipeg  
Public Works Department  
Email: [Mterleski@winnipeg.ca](mailto:Mterleski@winnipeg.ca)
- (c) The Contractor shall be responsible for replacing any missing or damaged barriers and its components at their own expense.
- (d) The Contractor shall unload and stockpile barriers as directed by the City.

#### E28.2.8 Measurement and Payment

- (a) Deliver and Install Portable Precast Traffic Barrier will be measured on a lump sum basis and paid for at the Contract Unit Price for the "Deliver and Install Portable Precast Traffic Barriers". The lump sum price will be for the total number of Portable Precast Traffic Barrier specified in E28.2.2(b), delivered and installed in accordance with this specification, approved by the Contract Administrator.
- (b) Relocate Portable Precast Traffic Barrier will be measured on a lump sum basis and paid for at the Contract Unit Price for the "Relocate Portable Precast Barrier". The lump sum price will be for the total number of Portable Precast Traffic Barrier specified in E28.2.2(b)(i), relocate and installed in accordance with this specification, approved by the Contract Administrator.
- (c) Salvage Portable Precast Traffic Barrier will be measured on a lump sum basis and paid for at the Contract Unit Price for the "Relocate Portable Precast Barrier". The lump sum price will be for the total number of Portable Precast Traffic Barrier specified in E28.2.2(b), salvaged in accordance with this specification, approved by the Contract Administrator.
- (d) Maintaining and adjusting barriers as required through the duration of the project shall be considered incidental to the Work. No measurement and payment will be made within this section.

### E29. DRAIN TILES

#### E29.1 Description

- E29.1.1 Notwithstanding and in addition to CW 3120 – Installation of Sub-Drains, this Specification shall cover the supply, fabrication and placement of drain tile and drain rock.
- E29.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all

things necessary for and incidental to the satisfactory performance and completion of all works as herein specified.

## E29.2 Materials

### E29.2.1 General

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification.
- (b) Drain Rock shall consist of natural gravel, crushed stone or other materials of similar characteristics having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.
- (c) Drainage Tile shall be 150 millimetre diameter gasket bell and spigot High Density Polyethylene (HDPE) Type SP pipe with Class 2 perforations in accordance with AASHTO M252-07.

## E29.3 Construction Methods

### E29.3.1 Placement of Drain Tile and Drain Rock

- (a) The placement of drain tile and drain rock shall be in conformance with the requirements of CW 3120 – Installation of Sub-Drains.
- (b) Only material placed within the designated sub-grade limits will be included in the payment for drain tile and drain rock. No measurement or payment will be made for drain tile and drain rock removed and replaced due to improper installation or damaged materials.

## E29.4 Quality Control

### E29.4.1 Inspection

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

### E29.4.2 Quality Testing

- (a) The Contract Administrator shall be afforded full access for the inspection and quality control testing of drain tile and drain rock at the Site, to determine whether the drain tile and drain rock are being supplied in accordance with this Specification.

## E29.5 Method of Measurement

### E29.5.1 Drain Tile and Drain Rock

- (a) Supply and installation of drain tile and drain rock will be measured on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work. Connections to catch basin and PVC pipe are incidental to the work.

## E29.6 Basis of Payment

### E29.6.1 Drain Tile and Drain Rock

- (a) Supply and installation of drain tile and drain rock will be paid for at the Contract Unit Price for “Drain Tiles”, which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

### **E30. PATCHING OF EXISTING PAVEMENT**

#### **E30.1 Description**

E30.1.1 This specification covers patching of existing concrete pavement in preparation for an asphalt overlay.

E30.1.2 Referenced Standard Construction Specifications

(a) CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

(b) CW 3130 – Supply and Installation of Geotextile Fabrics.

(c) CW 3410 – Asphaltic Concrete Pavement Works.

#### **E30.2 Materials**

E30.2.1 Crushed Sub-Base Material

Crushed Sub-base material will have a maximum aggregate size of 50 millimetre and be supplied in accordance with Section 2.1 of CW 3110.

E30.2.2 Geotextile Fabric

Geotextile fabric will be supplied in accordance with Section 2 of CW 3130.

E30.2.3 Asphalt Material

Asphalt material will be Type 1A and will be supplied in accordance with Sections 5 and 6 of CW 3410.

#### **E30.3 Construction Methods**

E30.3.1 Remove existing concrete pavement to a minimum width of 1.5 metres at locations as shown on the Drawings or as directed by the Contract Administrator in accordance with Section 3.1 of Specification CW 3110.

E30.3.2 Excavate to a depth of 350 millimetres below the top of the existing pavement.

E30.3.3 Compact existing sub-grade to a minimum of 95% Standard Proctor Density.

E30.3.4 Place separation/reinforcement geotextile fabric in accordance with Specification CW 3130.

E30.3.5 Place and compact crushed sub-base material in accordance with CW 3110 to a 300 millimetres compacted depth. Compact to a minimum of 100% Standard Proctor Density.

E30.3.6 Place and compact asphalt material to a 50 millimetres compacted depth matching the top of the existing concrete pavement. Compact to an average of 95% percent of the 75 Blow Marshall Density of the paving mixture with no individual test being less than 90% percent.

E30.3.7 Each layer must be levelled and accepted by the Contract Administrator before the succeeding layer may be placed.

E30.3.8 Additional excavation and placement of sub-base material beyond the identified pavement structure will be completed in accordance with CW 3110 as directed by the Contract Administrator.

#### **E30.4 Measurement and Payment**

E30.4.1 Pavement patching will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Pavement Patching". The area to be paid for will be the total number of square metres of pavement patched in accordance with this specification, accepted and measured by the Contract Administrator.

### **E31. WORKING IN CLOSE PROXIMITY TO SEWER INTERCEPTOR**

#### **E31.1 Description**

- (a) This Section details operating constraints for all work to be carried out in close proximity to the City feeder mains and other critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centreline of the feeder main, within 5 m of valve chambers and other appurtenances, and any other infrastructure identified below.

- E31.2 Granular material, construction material, soil or other material shall not be stockpiled within 5 meters of centreline of the sewer interceptor.
- E31.3 Stage construction such that the sewer interceptor is not subjected to significant asymmetrical loading at any time.
- E31.4 Where work is in close proximity to the sewer interceptor, utilize construction practices and procedures that do not impart excessive vibration loads on the sewer interceptor or that would cause the settlement of the subgrade below the sewer interceptor.
- E31.5 Concrete pavement removal and excavation within 3 metres horizontally of the sewer interceptor shall be completed by saw cutting and removal, or use of hand held jack hammers. Use of machine mounted concrete breakers above the sewer interceptor shall not be permitted.

### **E32. WORKING IN CLOSE PROXIMITY TO FEEDER MAINS**

#### **E32.1 Description**

- E32.1.1 This Section details operating constraints for all work to be carried out in close proximity to the City feeder mains and other critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centreline of the feeder main, within 5 m of valve chambers and other appurtenances, and any other infrastructure identified below.

#### **E32.2 General Considerations for Work in Close Proximity to Critical Water Infrastructure:**

- (a) feeder mains are a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to feeder mains shall be undertaken with an abundance of caution. Feeder mains cannot typically be taken out of service for extended periods to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences;
- (b) work around feeder mains shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement;
- (c) large diameter pressure pipe generally has limited ability to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters. PCCP typically fails in a non-ductile mode and has the potential to cause extensive consequential damage to infrastructure if failure should occur; and,
- (d) construction in close proximity to critical infrastructure shall not commence until both the equipment and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.

#### **E32.3 Submittals**

- E32.3.1 Submit proposed construction equipment specifications to the Contract Administrator for review a minimum of five (5) Business Days prior to construction. The equipment submission shall include:
  - (a) Equipment operating and payload weights;
  - (b) Equipment dimensions, including: wheel or track base, track length or axle spacing,
  - (c) Load distributions in the intended operating configuration.

- E32.3.2 Submit a construction method statement to the Contract Administrator a minimum of five (5) Business Days prior to construction. The construction method statement shall contain the following minimum information:
- (a) proposed construction plan including excavation locations, haul routes, excavation equipment locations, and loading positions;
  - (b) excavation plans, including shoring designs, for excavations occurring in close proximity to feeder mains (within 5 m horizontal of the pipe's centerline) where the excavation to be extended below the top of the feeder mains embedment zone (150 mm above the pipe);
  - (c) trenchless construction methodology for feeder main crossings, including: installation methods, means of grade control, means of confirming clear separation between the new LDS and existing feeder main; and,
  - (d) any other pertinent information required to accurately describe the construction activities in close proximity to the feeder main and permit the Contract Administrator to review the proposed construction plans.
- E32.3.3 Incomplete or partial submissions will not be reviewed and will be returned to the Contractor for re-submission.
- E32.3.4 Allow five (5) Business Days for review by the Contract Administrator.
- E32.4 Feeder Main Operational Limitations
- E32.4.1 Feeder main shutdowns are scheduled based on a number of factors including water demand, weather, reservoir operation, routine maintenance and repair work within the regional distribution system, and other factors. The City shall endeavour to make requested time periods available to the Contractor to schedule his/her work requiring removal of the feeder main from service, without limiting the City's control over the operation of the feeder main to complete other work, maintain adequate water supply and storage of water and maintain the integrity of the infrastructure. The City shall reserve the right to cancel and/or delay these schedule dates at any time, due to any circumstances that could adversely affect the feeder main or water supply including, but not limited to, high water demand, abnormal weather, failures of related water system components, and/or security concerns.
- E32.4.2 Scheduling Restrictions:
- (a) Temporary feeder main shutdowns shall be limited to off-peak demand seasons (September 15 to May 15) and low demand hours including evening or other low demand periods.
- E32.4.3 The Contractor shall provide Notice to the Contract Administrator in writing, a minimum of fifteen (15) Business Days prior to requiring the shutdown. The City will endeavour to schedule the shutdown as requested.
- E32.5 Pre-Work, Planning and General Execution
- E32.5.1 No work shall commence in close proximity to feeder mains, chambers, and critical infrastructure until the equipment specifications and construction method statement have been submitted and accepted, and feeder main locations have been clearly delineated in the field. Work over feeder mains shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications on the pipe.
- E32.5.2 Contact the City of Winnipeg Water and Waste Department, Construction Services Coordinator prior to construction.
- E32.5.3 Locate feeder mains and confirm their position horizontally and vertically at the proposed the following locations prior to undertaking work in close proximity to the identified feeder mains. Note exact locations to be identified in the field
- E32.5.4 Visually delineate all critical infrastructure identified herein on Site by use of paint, staking/flagging, construction fencing, snow fencing, or other suitable methods.

- E32.5.5 Only utilize construction practices and procedures that do not impart excessive vibratory loads on feeder mains and chambers or that would cause settlement of the subgrade below feeder mains and critical pipelines.
- E32.5.6 Where the existing road structure must be removed, crossing of critical infrastructure shall be prohibited from the time the existing roadway structure is removed until the completion of granular base construction. At all times prior to completion of final paving; reduce equipment speeds to levels that minimize the effects of impact loading to the critical infrastructure.
- E32.5.7 Only equipment and construction practices stipulated in the accepted construction method statement and the supplemental requirements noted herein may be utilized in close proximity to feeder mains, chambers, and other critical infrastructure identified herein.
- E32.5.8 Construction operations should be staged in such a manner as to limit multiple construction loads at one time, (e.g., offset crossings sufficiently from each other, rollers should remain a sufficient distance behind spreaders to limit loads. A reasonable offset distance is 3 m between loads).
- E32.5.9 Granular material, construction material, soil, and/or other material shall not be stockpiled on the pipelines or within 5 m of any feeder main, valve chamber, or other critical infrastructure identified herein.
- E32.5.10 The Contractor shall ensure that all crew members understand and observe the requirements of working near feeder mains, valve chambers, and critical infrastructure. Prior to commencement of on-Site work, the Contractor shall jointly conduct an orientation meeting with the Contract Administer, all superintendents, foreman, and heavy equipment operators to make all workers on the Site fully cognizant of the limitations of altered loading on, the ramifications of inadvertent damage to, and the constraints associated with work in close proximity to feeder mains and critical pipelines. New personnel introduced after commencement of the Project need to be formally orientated as outlined herein. It is recommended that restrictions associated with the crossing, consistent with the Contractor's submitted method statement be posted on Site and near the crossing.
- E32.6 Demolition, Excavation and Shoring
- E32.6.1 Use of pneumatic concrete breakers within 3 m of a feeder main, valve chamber, or critical pipeline is prohibited. Pavement shall be full depth sawcut and carefully removed. Use of hand held jackhammers for pavement removal will be allowed.
- E32.6.2 Offset excavation equipment a minimum of 3 m from the centerline of critical pipelines when undertaking excavations where there is less than 2.4 m of earth cover over the pipeline.
- E32.6.3 Utilize only smooth edged excavation buckets, soft excavation, or hand excavation techniques where there is less than 1.5 m of earth cover over the pipeline. Where there is less than 1.0 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation or soft excavation methods.
- E32.6.4 Equipment should not be allowed to operate while positioned directly over a feeder main or critical pipeline except were permitted herein, outlined in the reviewed and accepted construction method statement.
- E32.6.5 Excavations within 3 m of the outside edge of a feeder main (hydrovac holes for confirming trenchless installations excluded) and which extend below obvert of the feeder main shall utilize shoring methods that precludes the movement of native in-situ soils (i.e., a tight shoring system).
- E32.6.6 Pre-bore all piles to below the invert of critical infrastructure within 5 m (horizontally) of the pipeline's outside edge.
- E32.6.7 Offset pile driving equipment a minimum of 3 m (horizontally) from the centerline of the pipeline during piling operations.

### E32.7 Underground Construction and Trenchless Pipe Installation

- E32.7.1 Install pipes to the grades shown on the Drawings. A minimum clear separation distance (outside to outside of pipe wall) of 500 mm shall be maintained between crossing pipes and the feeder mains.
- E32.7.2 The Contractor shall locate feeder mains and confirm their position horizontally and vertically prior to commencing with any trenchless pipe installations to ensure proper clearances are maintained. Under NO circumstances should blind coring proceed across feeder mains.
- E32.7.3 The Contractor shall visually confirm the location and alignment of the drill rods or jacking pipe (horizontally and vertically) prior to proceeding with the trenchless installation beneath the feeder main. It is recommended that the new pipe alignment be confirmed within 2 m of the outside of the feeder main pipe but no closer than 0.5 m from the outside edge of the pipe.
- E32.7.4 No trenchless methods involving soil displacement (plugs) shall be permitted in the vicinity of the feeder main.
- E32.7.5 .Pressure grouting or approved alternative methods shall be used to fill voids caused by the installation or if the bored hole diameter is greater than the outside diameter of the pipe by more than 25 mm.
- E32.7.6 Where excavation is required within the feeder main's embedment zone, the Contractor shall take steps to ensure the granular embedment material surrounding the feeder main remains stable during the work and the feeder main outside of the excavation is not undermined.

### E32.8 Subgrade Construction

- E32.8.1 Subgrade and backfill compaction within 3 m (horizontal) of a critical pipeline or valve chamber shall be limited to non-vibratory methods only. Small walk behind vibratory packers will be permitted.
- E32.8.2 Subgrade, sub-base and base course construction shall be kept in a rut free condition at all times. Construction equipment is prohibited from crossing pipelines if the grade is insufficient to support the equipment without rutting.
- E32.8.3 Subgrade conditions should be inspected by personnel with competent geotechnical experience (e.g., ability to adequately visually classify soils and competency of subgrade, subbase, and base course materials). In the event of encountering unsuitable subgrade materials above the feeder main, proposed design revisions shall be submitted to this office for review to obtain approval from the Water and Waste Department relative to any change in conditions.
- E32.8.4 Fill material shall not be dumped directly on pipelines but shall be stockpiled outside the limits noted in these recommendations and shall be carefully bladed in-place.
- E32.8.5 Only use compaction equipment approved by the Contract Administrator to compact fill materials above critical pipelines. Compaction of fill materials shall be completed using static methods only, no vibratory compaction will be allowed within the limits noted in these recommendations.
- E32.8.6 Construction operations shall be staged to minimize the time period between excavation to subgrade and placement of granular subbase materials. Should bare subgrade be left overnight, measures shall be implemented to protect the subgrade against inadvertent travel over it and to minimize the impact of wet weather.

### E32.9 Subbase and Base Course Construction

- E32.9.1 Subbase or base course materials shall not be dumped directly on pipelines but shall be stockpiled outside limits noted in these recommendations and shall be carefully bladed in-place.

E32.9.2 Subbase compaction within 3 m horizontal of the centreline of a critical pipeline shall be either carried out by static methods (without vibration) or with smaller approved equipment such as hand held plate packers or smaller roller equipment.

### E32.10 Paving

E32.10.1 When constructing asphalt pavements only non-vibratory compaction should be used within 3 m (horizontal) of the center of critical pipelines.

## **E33. HYDRO-EXCAVATION**

### E33.1 Description

E33.1.1 This specification shall cover the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the recovery of excavated material by vacuum type means or equivalent method as approved by the Contract Administrator.

### E33.2 Equipment

E33.2.1 Hydro-Excavation equipment shall be capable of maintaining a minimum working pressure of 10,000 psi, at a rate of flow of 10 to 12 gallons per minute. The unit should be adjustable, so as to provide adequate pressure to remove earthen material identified by the Contract Administrator.

E33.2.2 Spray head shall be equipped with a rotating type nozzle in order to provide a wider path of cut.

### E33.3 Construction Methods

#### E33.3.1 Hydro-Removal of Earthen Material

(a) Earthen material adjacent to utility entity shall be sprayed with high pressure water so as to remove all such material identified by the Contract Administrator.

#### E33.3.2 Recovery of Excavated Material

(a) The recovery of excavated material shall be done using a vacuum type method, or other type method as approved by the Contract Administrator.

(b) The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filling with excavated material.

(c) The use of mechanical sweepers will not be allowed.

(d) Dispose of material in accordance with Section 3.4 of CW 1130-R2.

### E33.4 Measurement and Payment

E33.4.1 Hydro-Excavation will be measured on a time basis and paid for at the Contract Unit Price per hour for "Hydro-Excavation". The hours are to be paid for will be the total number of hours of hydro-excavation in accordance with this specification, accepted and recorded by the Contract Administrator.

E33.4.2 Hydro-Excavation will not be measured and shall be included in the unit price for "CIP Reinforced Concrete Pile for Pedestrian Light"

## **E34. SOFT EXCAVATION TO EXPOSE UNDERGROUND UTILITIES**

### E34.1 Description

E34.1.1 This specification covers the soft excavation to expose underground utilities to determine the depth of the underground utility and whether it will interfere with the installation of proposed Works on site.

E34.1.2 These underground utilities include, but are not limited to, Manitoba Hydro cables, MTS cables, CPR, existing sewers, and existing watermains.

#### E34.2 Materials

##### E34.2.1 Backfill Material

- (a) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand as per City of Winnipeg Standard Construction Specification CW 2030.

#### E34.3 Construction Methods

E34.3.1 Prior to commencement of any construction works adjacent to underground utilities, the Contractor shall use soft digging or hand excavation to expose the underground utilities.

E34.3.2 Once the elevation of the top of the pipe or duct has been determined the resulting excavation shall be backfilled with bedding sand to the elevation of the existing ground.

#### E34.4 Measurement and Payment

E34.4.1 Soft excavation to expose underground utilities will be considered incidental to the Work. No measurement and payment will be made within this section.

### **E35. CRASH ATTENUATION BARRELS**

#### E35.1 Description

E35.1.1 The Work covered under this item shall include all operations related to the supply, fabrication, delivery and installation of the new Crash Attenuation Barrels and associated materials in accordance with NCHRP Report 350.

E35.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of the Work as hereinafter specified. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

E35.1.3 General supply, loading, hauling, unloading, storing and installing is as per Manufacturer's recommended procedures.

E35.1.4 The Crash Attenuation Barrel manufacturer product data sheet shall be submitted to the Contract Administrator for approval prior to supply and installation.

##### E35.1.5 Drawings and Manuals

- (a) Appendix 'F' – Crash Attenuation Barrels Product Information.

#### E35.2 Materials

E35.3 Materials shall be supplied in accordance with the manufacturer's product manual and in accordance with NCHRP Report 350.

E35.4 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this specification.

#### E35.5 Approved products are:

- (a) Big Sandy Impact Attenuator Sand Barrels by Traffix Devices Inc.; and,

E35.5.1 Sand required for the barrels shall contain a minimum of five percent (5%) rock salt (NaCl), by weight.

#### E35.6 Construction Methods

- E35.6.1 The Crash Attenuation Barriers shall be installed in accordance with the manufacturer's installation manual.
- E35.6.2 The Contractor shall be responsible for loading, and unloading as well as storing of the crash attenuation barrels. The Contractor shall supply all necessary equipment for loading, hauling, unloading, and storing of the components.
- E35.6.3 Prior to commencing installation of the protection at a location, the Contractor shall verify that it can be installed in strict accordance with the Drawings. Should there be a conflict between a proposed location and any facility the Contract Administrator shall be notified immediately.
- E35.6.4 Barrels associated with the roadway staging shall be relocated by the Contractor between Stage I and Stage II. Relocation shall include all necessary equipment, materials, labour, safe storage and related operations required to relocate the barrels to the satisfaction of the Contract Administrator.
- E35.7 Salvage and Delivery
- E35.7.1 The Contractor shall salvage and deliver aluminum balanced barrier rails and posts to the City of Winnipeg Bridge Yard specified in E28.2.7(a).
- E35.7.2 The Contractor shall contact the City of Winnipeg personnel specified in E28.2.7(b)(i) to arrange suitable time and date of delivery.
- E35.8 Measurement and Payment
- E35.8.1 Supply and installation of Crash Attenuation Barrels, and all related appurtenances will be measured on a lump sum basis and at the Contract Unit Price in accordance with this Specification, accepted and measured by the Contract Administrator.
- E35.8.2 Salvage and delivery of Crash Attenuation Barrels, and all related appurtenances will be measured on a lump sum basis and paid for lump sum basis at the Contract Unit Price in accordance with this Specification, accepted and measured by the Contract Administrator.
- E35.8.3 The unit price for "Supply and Install Crash Attenuation Barrels" will be payment in full for the supply and installation of the barrels to site, placement and filling of barrels, relocation of barrels associated with the roadway detour and all related operations as herein described and all other items incidental to the work included, accepted and measured by the Contract Administrator.
- E35.8.4 The unit price for "Salvage and Delivery of Crash Attenuation Barrels" will be payment in full for the salvage and delivery of the barrels to the City of Winnipeg Bridge Yard, accepted and measured by the Contract Administrator.
- E35.8.5 Relocation and maintenance of barrels associated with the roadway detour shall be considered incidental to the Work.

### **E36. CAST-IN-PLACE CONCRETE FOR LIGHT POLE BASES AND BENCH**

- E36.1 Description
- (a) The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete for pedestrian light poles base and bench as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.
- E36.2 Materials
- E36.2.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

#### E36.2.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard A23.1-14.

#### E36.2.3 Testing and Approval

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

#### E36.2.4 Patching Mortar

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

#### E36.2.5 Cement

- (a) Cement shall be Type HS or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of CSA Standard A23.1-14.

#### E36.2.6 Concrete

- (a) General
  - (i) Concrete repair material shall be compatible with the concrete substrate.
  - (b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1-04:
    - (i) Class of Exposure: S-1
    - (ii) Compressive Strength @ 28 days = 32 MPa
    - (iii) Water / Cementing Materials Ratio = 0.45
    - (iv) Air Content: Category 2 per Table 4 of CSA A23.1-04 (4-7%)
    - (v) Cement – shall be as specified in E14.2.5.
  - (c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.
  - (d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for the foundations.
  - (e) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.
  - (f) The temperature of all types of concrete shall be between 15°C and 25°C at discharge. Temperature requirements for concrete containing silica fume shall be

between 10°C and 18°C at discharge unless otherwise approved by the Contract Administrator.

- (g) Concrete materials susceptible to frost damage shall be protected from freezing.

#### E36.2.7

##### Aggregate

- (a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with CSA A23.1.
- (b) Coarse Aggregate
  - (i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".
  - (ii) Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; and shall have an absorption not exceeding 2.25%.
  - (iii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, and excess of thin particles or any other extraneous material.
  - (iv) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
  - (v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.
- (c) Fine Aggregate
  - (i) Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, Gradation FA1.
  - (ii) Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.
  - (iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

#### E36.2.8

##### Cementing Materials

- (a) Cementing materials shall conform to the requirements of CSA A3001.
- (b) Silica Fume
  - (i) Should the Contractor choose to include silica fume in the concrete mix design, it shall not exceed 8% by mass of cement.
- (c) Fly Ash
  - (i) Fly ash shall be Type C1 or Type F and shall not exceed 25% by mass of cement.
- (d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening or formation of lumps shall not be used in the Work.

#### E36.2.9

##### Admixtures

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

- (b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.
- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators, and air-reducing agents will not be permitted, unless otherwise approved by the Contract Administrator.
- (d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.
- (e) An aminocarboxylate based migrating corrosion inhibitor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject to the approval of the Contract Administrator.

#### E36.2.10 Water

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

#### E36.2.11 Concrete Supply

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

#### E36.2.12 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars. Reinforcing steel supply and installation will be incidental to construction of concrete foundation and no separate payment will be made.

#### E36.2.13 Miscellaneous Materials

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

### E36.3 Construction Methods

#### E36.3.1 Location and Alignment of Foundations

- (a) Foundation construction shall not commence until the Contractor has obtained clearance from the appropriate Utility Authorities.
- (b) Foundations shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.
- (c) The deviation of the axis of any finished foundation shall not differ by more than 1 percent from the vertical.

#### E36.3.2 Buried Utilities

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

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

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

#### E36.3.3 Excavation

- (a) The Contractor is responsible for determining the excavation method at each foundation location.
- (b) Excavations for foundations shall be made with equipment designed to remove a core of the diameter shown on the Drawings, or hydro-jet excavation to a depth to bypass and/or expose adjacent utilities.
- (c) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.
- (d) All excavated material from the foundations shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.
- (e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after boring has been completed.

#### E36.3.4 Sleeving

- (a) Timber or steel sleeving shall be used to temporarily line the bore to prevent bulging or caving of the walls and to protect men at work in the bore.
- (b) The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.
- (c) The sleeving shall be withdrawn as the concrete is placed in the bore. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.
- (d) The clearance between the face of the bore hole and the sleeving shall not exceed 75 mm.

#### E36.3.5 Inspection of Bores

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

#### E36.3.6 Placing Reinforcing Steel

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

#### E36.3.7 Forms

- (a) Forms for exposed surfaces that require an "ordinary surface finish" shall be made of good quality plywood, or an approved equivalent, of uniform thickness, with or without a form liner.

- (b) Architectural concrete form liner shall be as specified on the Plans or equivalent as approved by the Contract Administrator.
- (c) Permeable formwork liner shall be Drainoform, Zemdrail II, or equivalent as approved by the Contract Administrator.
- (d) Formwork materials shall conform to CSA Standard CAN/CSA-A23.1, and American Concrete Publication SP:4, "Formwork for Concrete".
- (e) No "stay-in-place" formwork or falsework is permitted.
- (f) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.
- (g) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved manufacturers are "Evans" and "C-Z".
- (h) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (i) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place, must be made from a nonrusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (j) Forms for exposed concrete surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (k) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand distortion from all the forces to which the forms will be subjected. Minimum dimensions shall be 50 mm x 150 mm.
- (l) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm.
- (m) All forms are incidental to these Works and must be removed by the Contractor once adequate strength and curing of the concrete has been achieved.
- (n) The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.
- (o) For piles foundation, the top of the piles shall be formed with tubular forms (Sonotube) to the depth shown on the Drawings.

#### E36.3.8 Placing Concrete

- (a) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 100 mm. The concrete shall be vibrated throughout the entire length.
- (b) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile/bench shall be finished smooth and even with a hand float.
- (c) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator.

#### E36.3.9 Protection of Newly Placed Concrete

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

#### E36.3.10 Curing Concrete

- (a) The top of the freshly finished concrete foundations shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter.
- (b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

- (c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one hour or 20° in twenty-four hours.

#### E36.3.11 Form Removal

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

#### E36.3.12 Patching of Formed Surfaces

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

#### E36.3.13 Cold Weather Concreting

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

#### E36.3.14 Anti-Graffiti Coating

- (a) Anti-graffiti coating shall be applied to all planter walls and grade beams supporting wooden bench and stage at Public Monument to the 1919 Winnipeg General Strike shown on the drawings or identified by the Contract Administrator.
- (b) The anti-graffiti coating shall be applied according to manufactures specifications.
- (c) Maintain anti-graffiti coating on all vertical concrete surfaces for a period of two (2) years.

#### E36.3.15 Waterproofing

- (a) Waterproofing membrane shall be applied to all new concrete planter interior walls and existing concrete columns within the planters which will come into contact with planting soil, as identified on the drawings or by the Contract Administrator. The

waterproofing membrane shall be roller applied according to manufactures specifications.

**E36.3.16 Drilling Anchor Rods**

- (a) The anchor rods shall be aligned with a steel template to match the steel plates/angles holes as per Drawings. Extreme care shall be used in this operation to ensure rods are aligned properly and avoid direct contact with internal reinforcing steel.
- (b) Size and embedment of the anchor rods shall be as per Drawings.
- (c) Anchor rods doweling shall be performed using SIKA AnchorFix-3 / SIKA AnchorFix-4 epoxy adhesive or equivalent product. Installation of the anchor rods shall be done in accordance with manufacturer's instructions or recommendation.

**E36.3.17 Quality Control**

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

**E36.4 Measurement and Payment**

**E36.4.1** Supply and Installation of CIP Reinforced Concrete Pile for Pedestrian Light will be measured on a unit basis and paid for at the Contract Unit Price for "CIP Reinforced Concrete Pile for Pedestrian Light". The quantity to be paid for shall be the total number of units supplied and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

**E36.4.2** Supply and Installation of CIP Reinforced Concrete Bench will be measured on a lump sum basis and paid for at the Contract Unit Price for "CIP Reinforced Concrete Bench". The quantity to be paid for each unit of supplied and placed in accordance with this Specification and accepted by the Contract Administrator.

**E36.4.3 Construction of Cast-in-Place Concrete**

- (a) Construction of cast-in-place concrete will be measured on a unit basis for CIP Reinforced Concrete Pile for Pedestrian Light,

**E37. UNIT PAVING**

**E37.1 Description**

**E37.1.1** Provide all labour, materials, methods, equipment and accessories for the supply and installation of unit paving in formed blockouts, pavers as indicated on the Drawings.

**E37.2 References**

**E37.2.1** CW 3330 – Installation of Interlocking Paving Stones

**E37.2.2** CW 3335 – Installation of Interlocking Paving Stones on a Lean Concrete Base

**E37.3 Materials**

**E37.3.1 Unit Pavers:**

- (a) 194 x 93 x 57mm clay brick paver, manganese ironspot.

- (b) 194 x 93 x 57mm clay brick paver, medium ironspot.
- (c) Available from Alsip's Building Products and Services Ph. 204-667-3330, or approved equal.

E37.3.2 Bedding Sand

- (a) Bedding sand shall be fine aggregate to the requirements of specification CW3330.

E37.3.3 Joint Sand

- (a) Joint sand to the requirements of specification CW3330.

E37.4 Construction Methods

E37.4.1 Contractor to verify the exact dimensions of pavers prior to the construction of blockouts in concrete sidewalk. Have pavers on site for reference when constructing blockouts.

E37.4.2 Install concrete sidewalk with blockouts as specified on Drawings.

E37.4.3 Preparation of Sand Base

- (a) Remove all accumulated debris from blockouts.
- (b) Install bedding sand to the depths indicated on the Drawings and to CW3330.
- (c) Do not compact sand base prior to installing pavers.

E37.4.4 Installation of Unit Pavers

- (a) Unit pavers shall be installed in formed concrete blockouts in accordance with the specification CW3335, set in locations and patterns as shown on the Drawings. Spaces between joints shall be uniform, consistent, shall not exceed 5mm, and shall maintain true patterns as indicated on the Drawings.
- (b) Commence installation of pavers against edge to obtain straightest possible course for installation.
- (c) Pavers shall be cut with saw only to obtain true even undamaged edges. Chipped pavers are unacceptable.
- (d) Crews shall work on installed pavers, not on sand layer.
- (e) Spread and fine grade joint sand over paving surface and sweep into joints.
- (f) Sweep remaining sand over all paving areas and remove from site.
- (g) Replace at no extra cost all whole or cut stones marked as unacceptable.
- (h) Remove cracked, chipped, broken or otherwise damaged paving materials from Site immediately.
- (i) Upon completion, clean in accordance with manufacturers recommendations.

E37.5 Quality Assurance

E37.5.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations, from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection of approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this specification.

E37.6 Measurement and Payment

E37.6.1 Unit Paving in Formed Blockouts

- (a) Unit pavers will be measured on an area basis and will be paid for at the Contract Unit Price per square metre for the following items of Work, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification. The area to be paid for shall be the total

installed area of each type of unit paving accepted and measured by the Contract Administrator.

- (b) Items of Work:
  - (i) Clay brick paver, manganese ironspot
  - (ii) Clay brick paver, medium ironspot

E37.6.2 Lean Concrete Base

- (a) Lean concrete base shall be measured and paid for in accordance with CW 3335-R1.

**E38. BIKE LANE SURFACE PAINTING**

E38.1 Description

E38.1.1 The work of this section comprises the furnishing of all labour, equipment and materials required to complete the surface painting as shown on the drawings and as hereinafter specified.

E38.2 General

E38.2.1 Drawings and Manuals

- (a) Appendix 'B' – Application Instruction – MMAX Area Markings
- (b) Appendix 'C' – Cyclegrip MMAX Specification
- (c) Appendix 'D' – HITEX CM Primer and PumaTrack Rollable Road Surface System

E38.3 Material

E38.3.1 Paint colour, "Green" shall conform to City of Winnipeg specification for reflectorized traffic paint or suitable equivalent for application to asphalt / concrete surface.

- (a) CycleGrip® MMAX kit – includes CycleGrip® MMAX Resin (**green**), CycleGrip® MMAX Aggregate and Catalyst;
- (b) HITEX International Group –PumaTrack MMA Cold Applied Surface Treatment;
- (c) Or approved equal.

E38.4 Source

E38.4.1 Promark Line Painting Inc.  
Attention: Gary McCaskill  
Ph: 204-999-2008  
Email: [gary@promarklinepainting.com](mailto:gary@promarklinepainting.com)  
Web: <http://promarklinepainting.com/>

E38.4.2 Ennis-Flint  
Attention: Deryk Upton  
Ph: 604-315-8765  
Email: [dupton@ennisflint.com](mailto:dupton@ennisflint.com)  
Web: [www.ennisflint.com](http://www.ennisflint.com)

E38.5 Construction Methods

E38.5.1 The Bike Lane Surfacing Painting shall be installed in accordance with the manufacturer's installation manual.

E38.5.2 CycleGrip MMAX

- (a) Preparation and Installation
  - (i) Surface is to be prepared in accordance with Appendix 'B' and Appendix 'C'
  - (ii) Treatment is to be installed in accordance with Appendix 'B' and Appendix 'C'

E38.5.3 HITEX International Group

- (a) Preparation and Installation
  - (i) Surface to be prepared in accordance with Appendix 'D'
  - (ii) Treatment is to be installed in accordance with Appendix 'D'

#### E38.6 Measurement and Payment

- E38.6.1 Supply and installation of MMA bike lane treatment will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Coloured Bike Lane Treatment". The area to be paid for will be the total number of square metres of MMA bike lane treatment supplied and installed in accordance with this specification, as accepted and measured by the Contract Administrator.
- E38.6.2 Surface preparation shall be considered incidental to "Coloured Bike Lane Treatment". No measurement and payment will be made within this section

### **E39. SALVAGE OF EXISTING ALUMINUM BALANCED BARRIER RAILS AND POSTS**

#### E39.1 Description

##### E39.1.1 General

- (a) Further to CW 3650, this Specification shall cover the removal and salvage of existing aluminum balance barrier rails and posts as specified on the contract drawings or as directed by the Contract Administrator. The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work specified.

#### E39.2 Materials

- (a) The existing aluminum balanced barrier rails and posts shall be safely removed and returned to the City of Winnipeg Yard as requested by the Contract Administrator.
- (b) The Contractor shall be responsible for the safe storage and handling of all materials set forth in this Specification.
- (c) All damage or missing materials or components resulting from handling and storage operations shall be replaced by the Contractor's expense, to the satisfaction of the Contract Administrator.

#### E39.3 Construction Methods

- (a) The Contractor shall remove and salvage existing aluminum balanced barrier rails in accordance with CW 3650.
- (b) Each existing aluminum balanced guardrail post is to be safely lifted vertically by means of mechanical method ensuring that no structural damage has occurred. The posts are to be stock piled on-site and delivered back to the City of Winnipeg Bridge Yard specified in E28.2.7(a).

#### E39.4 Delivery

- E39.4.1 The Contractor shall salvage and deliver and un-used aluminum balanced barrier rails and posts to the City of Winnipeg Bridge Yard specified in E28.2.7(a).
- E39.4.2 The Contractor shall contact the City of Winnipeg personnel specified in E28.2.7(b)(i) to arrange suitable time and date of delivery.

#### E39.5 Measurement and Payment

- E39.5.1 Removal, stockpiling and delivery of aluminum balanced guardrail and posts will be measured on a length basis and paid for at the Contract Unit Price per unit for "Removal and Salvage of Existing Aluminum Balance Guardrail System and Posts". The unit to be

paid for will be the total meters of barrier rail and posts salvaged and delivered in accordance with this specification and accepted by the Contract Administrator.

#### **E40. BRIDGE ALUMINUM BALANCED BARRIER**

##### **E40.1 Description**

###### **(a) General**

- (i) This Specification shall cover all operations related to the supply and installation of aluminum balanced barriers, as specified herein and as shown on the Drawings.
- (ii) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all works as hereinafter specified.

##### **E40.2 Referenced Specifications and Drawings**

- (i) The latest edition and all subsequent editions of the following:
  - (i) Aluminum Balanced Barrier in accordance with Standard Construction Specification CW 3650 and as shown on the Drawings.

##### **E40.3 Scope of Work**

- (a) The Scope of Work under this Specification shall involve:
  - (i) Supply and installation of the bridge aluminum barrier rails and posts on the new concrete bridge barriers in accordance with the Drawings;
  - (ii) Supply and installation of the anchors for the bridge aluminum barrier rails on the concrete traffic barrier in accordance with the Drawings; and
  - (iii) Preparing the site and existing surface to install components; and

##### **E40.4 Submittals**

- (a) The Contractor shall submit to the Contract Administrator for review prior to commencement of any scheduled Work on the site, product data showing evidence that the proposed material meets the specified product.

##### **E40.5 Materials**

###### **(a) General**

- (i) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.
- (ii) All materials shall be stored in neat regular piles, on blocks or built up platforms, in order to avoid damage or contamination, and for ease of checking, handling and inspection.

##### **E40.6 Bridge Aluminum Balanced Barrier Components**

- (a) Aluminum balanced barrier components shall be aluminum barrier rail section, barrier posts, splice bars and rail clamp bars conforming to ASTM Standard B221, Alloy 6061-T6 or Alloy 6351-T6; end caps shall conform to ASTM cast alloy 535.2.
- (b) All barrier rails that are to be installed around radii less than 50 m shall be pre-bent by mechanical methods prior to delivery to the site.
- (c) The top edges and corners of barrier posts shall be rounded smooth as shown on Standard Drawing CW 302. Rounded edges damaged during installation shall be repaired by the Contractor to the satisfaction of the Contract Administrator.
- (d) End caps shall be permanently welded onto the ends of all barrier rail installations, as shown on Standard Drawing CW 302.
- (e) Steel washers shall conform to ASTM A743/A743M, Type 316 Stainless Steel.
- (f) Cap screws shall conform to ASTM A743/A743M, Type 316 Stainless Steel.

- (g) All other materials not specifically described but required for a complete and proper installation are to be selected by the Contractor subject to the approval of the Contract Administrator.
- (h) All Bridge Aluminum Balanced Barrier components shall be in accordance with Standard Construction Specification CW 3650 and as shown on the Drawings.

**E40.7 Alkali-Resistant Bituminous Paint**

- (a) Alkali-resistant bituminous paint shall meet the requirements of CGSB Specification 31-GP-3M.

**E40.8 Quality**

- (a) General
  - (i) All workmanship and all materials furnished and supplied under this specification are subject to close and systematic inspection and testing by the Contract Administrator. 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.
  - (ii) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Specification.
  - (iii) Roadside hazard protection components installed with inaccurate alignment and/or poor grade or curvature shall be corrected by the Contractor to the satisfaction of the Contract Administrator.

**E40.9 Measurement and Payment**

- (a) Supply and installation of guardrail, posts, and all related appurtenances will be measured on a linear length basis and paid for at the Contract Unit Price for the "Bridge Aluminum Balanced Barrier". The length to be paid for will be the total number of meters of Bridge Aluminum Balanced Barrier in accordance with this specification, accepted and measured by the Contract Administrator.

**E41. METAL SIGN SUPPORTS**

**E41.1 Description**

- E41.1.1 Provide all labour, materials, methods, equipment and accessories for the fabrication and installation of interpretive, trailhead, and wayfinding sign structures and mounting brackets.

**E41.2 References**

- E41.2.1 American Society for Testing and Materials International, (ASTM)
  - (a) ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - (b) ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - (c) ASTM B221-14 Specification for Aluminum and Aluminum-Alloy. Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - (d) ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - (e) ASTM F593-17 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- E41.2.2 Canadian Standards Association (CSA International).
  - (a) CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.

- (b) CAN/CSA-G164-M93(R1998), Hot Dip Galvanized or Irregularly Shaped Articles, or latest.
- (c) CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
- (d) CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- (e) CSA W59-1989, R2001, Welded Steel Construction, Metal Arc Welding, Imperial Version.

#### E41.3 Materials

- E41.3.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- E41.3.2 Aluminum for sign mounting brackets: to ASTM B221-14.
- E41.3.3 Welding materials: to CSA W59.
- E41.3.4 Welding electrodes: to CSA W48 Series.
- E41.3.5 Hardware and anchor bolts: to ASTM F593-17.
  - (a) Anchor 12 dia. x 150mm long stainless steel conc. wedge anchors.
  - (b) Wood Screws 8 x 25mm long stainless steel wood screws.
  - (c) Anchor Bolts: 13mm dia. x 100mm long stainless steel anchor bolts.

#### E41.4 Finishes

- E41.4.1 Interpretive sign supports to be hot dip galvanized following fabrication, to CAN/CSA-G164-M93.
- E41.4.2 Trailhead sign supports to be hot dip galvanized following fabrication, to CAN/CSA-G164-M93.
- E41.4.3 Wayfinding mounting brackets to be powder coated following fabrication, using shop-applied exterior grade polyester thermoplastic powder coating designed for maximum mechanical performance, impact resistance and UV-stability. Colour: Semi-gloss black.

#### E41.5 Submittals

- E41.5.1 Submit shop drawings for all metal sign supports:
  - (a) Shop drawing to clearly indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number and size of anchors, supports, reinforcement, details and accessories.
  - (b) Indicate and list hardware and miscellaneous items.
  - (c) Provide templates, patterns, fixing diagrams as required.
  - (d) Indicate related, adjacent materials, and connections.
- E41.5.2 Shop drawings for wayfinding sign brackets must be sealed by a Structural Engineer licensed to practice in the province of Manitoba, and shall include wind load calculations.
- E41.5.3 Submit samples of the following:
  - (a) One (1) each full size wayfinding sign mounting bracket. Approved sample may be used in the Work.

#### E41.6 Delivery, Storage and Handling

- E41.6.1 Deliver materials to site, suitably packaged. Do not deliver materials long before they are required on site. Cause no delays to scheduling.
- E41.6.2 Deliver all metal components to site complete with protective covering. Leave protective covering in place until final cleaning of site. Provide instructions for removal of protective covering.

- E41.6.3 Store materials in a dry location off the ground, and prevent damage.
- E41.6.4 Materials that have been damaged or deemed unfit for use during delivery or storage shall be immediately replaced at no cost.
- E41.6.5 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- E41.7 Site Conditions
  - E41.7.1 Make a careful examination of the site and structures and investigate all matters relating to the nature of the work to be undertaken, the means of access and egress, the rights and interests which may be interfered with during the construction of the Work.
  - E41.7.2 Report any discrepancies or omissions to the Contract Administrator, who will issue written clarification. Oral interpretations or instructions are not acceptable.
- E41.8 Construction Method
  - E41.8.1 Obtain approval of shop drawings prior to fabrication.
  - E41.8.2 Fabricate work square, true, straight and accurate to required sizes, with joints closely fitted and properly secured.
  - E41.8.3 Do welding work in accordance with CSA W59.
  - E41.8.4 Ensure exposed welds are continuous for length of each joint unless otherwise indicated. File or grind exposed welds smooth and flush.
  - E41.8.5 De-grease and be-bur all sharp edges in the shop left behind after fabrication is complete, prior to galvanization.
  - E41.8.6 Trailhead sign supports and interpretive sign supports to be hot-dip galvanize after fabrication. No touch-up, welding, drilling or grinding will be accepted after galvanization.
  - E41.8.7 Galvanizing:
    - (a) Prepare surfaces to ensure surface is free of grease, rust or scale.
  - E41.8.8 Wayfinding sign mounting brackets to be powder coated.
  - E41.8.9 Powder Coating:
    - (a) Comply with powder coating manufacturer's written instructions for surface preparation, including pre-treatment, application, baking, and minimum dry film thickness.
    - (b) Apply finish within 12 hours of surface preparation.
- E41.9 Installation
  - E41.9.1 Confirm locations and sign orientation with Contract Administrator prior to installation.
  - E41.9.2 Erect metal work square, plumb, straight and true, accurately fitted, with tight joints and intersections.
  - E41.9.3 Provide suitable and acceptable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
  - E41.9.4 Exposed fastening devices to match finish and be compatible with material through which they pass, per the Drawings.
  - E41.9.5 Make field connections with appropriately sized stainless steel hardware.
- E41.10 Acceptance
  - E41.10.1 Work will be accepted only if it is erected true to the design intent in conformation with shop drawings and site instructions.

#### E41.11 Measurement and Payment

- E41.11.1 The fabrication and installation of metal sign supports shall be measured on a unit each basis, and paid for at the Contract Unit Price per unit for the Items of Work listed below. The number of units to be paid for shall be the total number of metal sign supports installed in accordance with this specification, accepted and measured by the Contract Administrator.
- E41.11.2 Items of Work:
- (a) Trailhead Sign Supports
  - (b) Interpretive Sign Supports
  - (c) Wayfinding Sign Mounting Brackets
- E41.11.3 Concrete for trailhead sign base shall be measured and paid for in accordance with CW 3335-R1.
- E41.11.4 Signs are measured separately and shall be paid for under the Interpretive and Trailhead Signs Specification.

#### E42. EXTERIOR SITE CARPENTRY

##### E42.1 Description

- E42.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and install of trail bollards, trail signs and trailhead sign plywood.

##### E42.2 References

- E42.2.1 American Wood-Preservers' Association (AWPA)
- (a) AWPA M2, Standard for Inspection of Treated Wood Products.
  - (b) AWPA Standard for the Care of Preservative-Treated Wood Products.
- E42.2.2 Canadian Standards Association (CSA International)
- (a) CSA O141 Softwood Lumber.
  - (b) CSA O80, Wood Preservation.
  - (c) CSA O80.20, fire-retardant treatment of lumber by pressure processes.

##### E42.3 Materials

###### E42.3.1 Trail Bollard

- (a) Pressure treated timber c/w routed reveal, chamfered edges and sloped top to City of Winnipeg detail SCD-105D.
- (b) Stain: Flood Stain No. 303, colour: Slate Blue.
- (c) Material to be pressure treated wood, no. 1 grade, colour: brown, moisture content 19% or less in accordance with following standards: CAN/CSA-O141; NLGA Standard Grading Rules for Canadian Lumber; Forest Stewardship Council (FSC) certified .
- (d) Preservative for above ground use: to CSA-O80 Series, ACQ-C treatment, clear finish. Minimum net retention: 4.0 kg/m<sup>3</sup>.
- (e) Preservative for ground contact: to CSA-O80 Series, ACQ-C treatment, clear finish. Minimum net retention: 6.4 kg/m<sup>3</sup>.

###### E42.3.2 Trail Signs

- (a) Chief Peguis Greenway Trail Sign and North Winnipeg Parkway Sign, sized to suit trail bollard SCD-105D (235mm wide post). Trail Signs available from: Winnipeg Trails Association (WTA). Contact: Anders Swanson c/o Rivers West Red River Corridor Inc. ph.: 204-925-2321. Email: info@winnipegtrails.ca.

- (b) Trans Canada Trail Sign, sized to suit trail bollard SCD-105D (235mm wide post). Trail Sign available from: Trans Canada Trail (TCT) Contact: Heidi Tillmanns ph.: 1-800-465-3636. Email: HTillmanns@tctrail.ca.

#### E42.3.3 Trailhead Sign Plywood

- (a) Crezon plywood, primed & painted with Behr premium plus primer and sealer exterior, #43601. Colour: Silver Bullet N520-2. Paint to be mixed by manufacturer.

#### E42.4 Construction Methods

E42.4.1 Review and confirm trail bollard locations and orientation with Contract Administrator prior to installation.

E42.4.2 Construct all work as indicated on the Drawings using adequate fastening methods to ensure solid durable finished work suitable for the purpose intended.

E42.4.3 Re-treat pressure treated wood surfaces exposed by cutting, trimming or boring with liberal brush application of clear preservative and fire retardant before installation. Ensure that damaged areas such as abrasions, nail and spike holes, area thoroughly saturated with field treatment solutions as per CSA-O80 and CSA-O80.20.

E42.4.4 Handle and use treated and stained wood in a manner which will avoid damage or field fabrication causing alteration in original treatment.

E42.4.5 Set post vertical and backfill with limestone in lifts and tamp thoroughly each lift. Ensure posts are plumb.

E42.4.6 Stain wood bollard in situ. Ensure stain extends below finished grade.

#### E42.5 Measurement & Payment

##### E42.5.1 Trail Bollards

- (a) Trail Bollards will be measured on a unit basis and paid for at the Contract Unit Price per unit as "Trail Bollard" in accordance with this specification and accepted by the Contract Administrator.

##### E42.5.2 Trail Signs

- (a) Trail signs will be measured on a unit each basis, and paid for at the Contract Unit Price per unit for the Items of Work listed below. The number of units to be paid for shall be the total number of metal sign supports installed in accordance with this specification, accepted and measured by the Contract Administrator.

- (b) Items of Work:

- (i) Chief Peguis Greenway Trail Sign
- (ii) North Winnipeg Parkway Sign
- (iii) Trans Canada Trail Sign

##### E42.5.3 Plywood for Trailhead Sign

- (a) No payment shall be made for plywood for trailhead sign. Plywood for trailhead sign shall be considered incidental to the Work.

### **E43. INTERPRETIVE AND TRAILHEAD SIGNS**

E43.1 Provide all labour, materials, methods, equipment and accessories for the supply and install of interpretive and trailhead signs.

#### E43.2 Materials

E43.2.1 Interpretive Signs and Trailhead Signs: High Pressure Laminate sign system, 0.75 inch thickness, exterior matte finish, complete with mounting holes to match support structures, Folia System as supplied by SH Immersive Environments, 1-800-363-5304 or approved alternate. CMYK digital graphic supplied by Contract Administrator.

E43.2.2 Mounting Hardware: tamper resistant stainless steel bolts, sized to suit threaded inserts on signs, length to suit threaded inserts and backer board thickness.

E43.2.3 Backer board for trailhead signs: 19 mm thick crezon plywood, primed & painted.

E43.2.4 Primer & Paint: Behr premium plus primer and sealer exterior, #43601. Colour: Icicles N490-2. Paint to be mixed by manufacturer.

### E43.3 Submittals

E43.3.1 Digital Proofs: Submit 1/4 scale full colour digital proofs or approved alternate of all interpretive and trailhead signs for sign off by Contract Administrator.

E43.3.2 High Pressure Laminate Samples: submit one 200 x 200 mm full scale, full colour digital laminated sample cropped from one of the trailhead signs, and one 200 x 200 mm full scale, full colour digital laminated sample cropped from one of the interpretive signs. These samples will be reviewed for resolution, registration, legibility, gloss, and colour match. Acceptable samples will be formally signed off by the Contract Administrator.

### E43.3.3 Artwork

- (a) Artwork to be provided in digital (EPS) format by the Contract Administrator.
- (b) The artwork shall not be reproduced in any other form or in excess of the amount contracted for, except by written approval of the Contract Administrator. Such approval shall be sought through the City of Winnipeg Public Works Department.

### E43.4 Construction Methods

#### E43.4.1 Quality Assurance

- (a) Sign production shall be performed by trained and qualified workers with a minimum of 5 years experience, under controlled conditions.

#### E43.4.2 Mounting Holes

- (a) Mounting hole locations must be accurately placed, within 2 mm of the locations indicated on the Drawings to suit the pre-drilled mounting holes in the sign supports.

#### E43.4.3 Installation

- (a) Confirm locations and orientation of signs with Contract Administrator prior to installation.
- (b) Install using approved hardware.

### E43.5 Measurement and Payment

E43.5.1 The supply and installation of interpretive and trailhead signs shall be measured on a unit basis, and paid for at the Contract Unit Price per unit for the Items of Work listed here below. The number of units to be paid for shall be the total number of signs installed in accordance with this specification, accepted and measured by the Contract Administrator.

#### E43.5.2 Items of Work:

- (a) Interpretive Signs
- (b) Trailhead Signs

## E44. RETROFLECTIVE ALUMINUM SIGNS

E44.1 Provide all labour, materials, methods, equipment and accessories for the supply and install of retroflective wayfinding signs and settler signs on aluminum sign plate.

### E44.2 Materials

#### E44.2.1 Aluminum Sign Stock

- (a) Wayfinding Sign: Sign grade aluminum 5052 H36 or H38, 6.35 mm thk., size and shape as indicated on the Drawings.
- (b) Settler Sign: Sign grade aluminum 5052 H36 or H38, 6.35 mm thk., size and shape to match existing heritage sign on Kildonan Settlers Bridge. Contractor to field measure dimensions and confirm with Contract Administrator.

#### E44.2.2 Mounting Brackets

- (a) Wayfinding Signs: refer to Metal Sign Supports specification.
- (b) Settler Signs: re-use existing mounting brackets on street lights.

#### E44.2.3 Reflective Sheeting

- (a) 3M Brand Scotchlite Series 3200 Engineering grade Reflective Sheeting, or equivalent, complete with permanent pressure sensitive adhesive backing (Sheeting colour - 3290 White). Sheeting to comply with ASTM D4956-90.

#### E44.2.4 Printing Inks

- (a) Digital or silkscreen printing are acceptable. Inks to be matched UV stable, waterproof transparent inks, 3M Scotchlite 700 Series enamel-based ink system or approved equal. Inks shall be compatible to comply with reflective sheeting manufacturer's warranty requirements.

### E44.3 Submittals

#### E44.3.1 Samples

- (a) The Contractor shall provide one (1) each full scale colour sample of a wayfinding sign and one (1) settler sign to the Contract Administrator to ensure compliance with the Specifications and Drawings, and shall obtain written approval from the Contract Administrator prior to manufacture of full order. Sample must use specified inks and be printed on specified retroreflective sheeting.

#### E44.3.2 Digital Proofs: Submit 1/8 scale full colour digital proofs or approved alternate of the following for sign-off by Contract Administrator.

- (a) Ten (10) Settler Signs.
- (b) Four (4) Wayfinding Signs.

#### E44.3.3 Artwork

- (a) Artwork to be provided in digital (EPS) format by the Contract Administrator.
- (b) The artwork shall not be reproduced in any other form or in excess of the amount contracted for, except by written approval of the Contract Administrator. Such approval shall be sought through the City of Winnipeg Public Works Department.

### E44.4 Construction Methods

#### E44.4.1 Workmanship

- (a) Printing and application of sheeting shall be performed by trained and qualified workers with a minimum of 5 years experience, under controlled conditions.
- (b) In accordance with ASTM D4956-90, ink transparency and retroreflectivity shall be such that signs appear at night as they appear in daylight.

#### E44.4.2 Colour Matching

- (a) Ink colours applied to a reflective surface shall match the samples provided by the Contract Administrator to the satisfaction of the Contract Administrator.

#### E44.4.3 Colour Schedule

- (a) Contractor shall submit colour samples on reflective sheeting for approval prior to commencing screen printing.

E44.4.4 Registration

- (a) The Contractor shall note that **transparent inks** are specified for this work, and therefore accurate trapping settings and registration of all colours are critical to the appearance of the signs. Acceptable tolerances shall be to the highest standards of the silkscreen printing industry. **Any sign in which the registration is shifted by more than 2mm or which shows gaps between colour areas will be rejected.**

E44.4.5 Surface Preparation

- (a) Debur, degrease, etch and ease edges of sign plates to accept reflective sheeting decals in accordance with decal manufacturer's recommendations.

E44.4.6 Application of Sheeting

- (a) Apply sheeting in accordance with manufacturer's written specifications. Decals shall be centred precisely on base plate. Trim sheeting to form clean, smooth edge along perimeter of base plates.

E44.4.7 Installation

- (a) Wayfinding and settler signs will be installed at locations indicated on the drawings. Confirm locations with Contract Administrator prior to installation.
- (b) Wayfinding Signs: sign installation shall be completed in accordance with Traffic Services and Manitoba Hydro requirements and to their satisfaction.
- (c) Settler Signs: signs will be installed in the same locations as existing signs on the Kildonan Settlers Bridge. Sign installation shall be completed in accordance with Traffic Services and Manitoba Hydro requirements and to their satisfaction. The Contractor shall re-use existing mounting brackets and poles that are in good condition. Notify the Contract Administrator of any poles that are bent or misaligned and require replacement.

E44.5 Measurement & Payment

E44.5.1 The supply and installation of retroreflective aluminum signs shall be measured on a unit basis, and paid for at the Contract Unit Price per unit for the Items of Work listed here below. The number of units to be paid for shall be the total number of signs installed in accordance with this specification, accepted and measured by the Contract Administrator.

E44.5.2 Items of Work:

- (a) Wayfinding Signs
- (b) Settler Signs

**E45. SITE FURNISHINGS**

E45.1 Description

E45.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and install of benches and litter receptacles.

E45.2 Submittals

E45.2.1 Submit product data and shop drawings for bench and waste receptacle. Indicate sizes, assembly, and installation details.

E45.3 Materials

E45.3.1 Bench

- (a) Terassa Series Bench, surface mounted, 1.8m long, IPE wood slats, arm rests, galvanized finish. Available from Urban Park, ph. 1-800-775-0018, or approved equal.

E45.3.2 Litter Receptacle

- (a) Belle Isle Litter Receptacle, surface mounted, 23" dia. x 30" ht. vertical slots, 1 access hole, no ash urn, including black liner, galvanized finish. Available from Urban Park, ph. 1-800-775-0018, or approved equal.

E45.3.3 Anchor Bolts

- (a) 6mm dia. x 100 long stainless steel anchor bolts.

E45.4 Construction Methods

E45.4.1 All work is to be located and installed in accordance with the Drawings and manufacturers specifications.

E45.4.2 All furnishings to be installed plumb and true to correct elevations and location, as directed by the Contract Administrator. The Contractor shall confirm proposed locations of all site furnishings with Contract Administrator prior to installation.

E45.4.3 All furnishings to be carefully handled so that no parts will be bent, broken, or otherwise damaged. Contractor is responsible for replacing any damaged furnishings, prior to installation, at no cost to the City.

E45.5 Measurement and Payment

E45.5.1 The supply and installation of Site Furnishings will be paid for on a unit basis each for the Items of Work listed below. Price shall be payment in full for supplying materials and for performing the Work in accordance with this Specification and accepted and measured by the Contract Administrator. Prices to include all mounting hardware.

E45.5.2 Items of Work:

- (a) Benches
- (b) Litter Receptacles

**E46. PLANTING MEDIUM & FINISHED GRADING**

E46.1 Description

E46.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and installation of planting medium for tree wells, shrub beds, sod areas and naturalized seeding areas.

E46.2 References

E46.2.1 Agriculture and Agri-Food Canada

E46.2.2 .1 The Canadian System of Soil Classification, Third Edition, 1998.

E46.2.3 Canadian Council of Ministers of the Environment (CCME) Guidelines.

E46.2.4 The City of Winnipeg Standard Construction Specifications

E46.2.5 .1 CW 1130 – Site Requirements

E46.2.6 .2 CW 3540 – Topsoil and Finish Grading for Establishment of Turf Areas

E46.3 Submittals

E46.3.1 Submit 0.5kg sample of topsoil to National Testing Laboratory, or approved alternate, and indicate present use and intended use. Prepare and ship sample in accordance with Provincial regulations and testing laboratory requirements.

E46.3.2 Submit two (2) copies of soil analysis and recommendations for corrections to Contract Administrator.

E46.4 Quality Assurance

- E46.4.1 Inform Contract Administrator of proposed source of materials to be supplied and provide a sample for review by Contract Administrator prior to installation.
- E46.4.2 Testing of planting medium to be carried out and paid for by Contractor. Prepare and ship planting medium samples to approved laboratory in accordance with Provincial regulations and laboratory requirements, indicating intended use on each sample.
- E46.4.3 Test planting medium for nutrients N, P, K, micronutrients, soluble salt content, pH value and OM (organic matter).
- E46.4.4 Acceptance of planting medium is subject to an inspection of material and confirmation of test results. Do not commence soft landscaping work until Contract Administrator has accepted planting medium.

E46.5 Delivery, Storage and Handling

- E46.5.1 Store materials in a dry area, protected from freezing, sedimentation and contamination.
- E46.5.2 Deliver and store fertilizer in waterproof bags labeled with weight, analysis and name of manufacturer.

E46.6 Materials

- E46.6.1 Planting Medium: In accordance with CW 3540 for topsoil except organic matter to be in the range of 5-10%.
- E46.6.2 Peatmoss: deliver from partially decomposed fibrous or cellular stems and leaves of species of sphagnum mosses. Elastic and homogeneous, brown in colour. Free of wood and deleterious material that could prohibit growth. Shredded particle minimum size: 5 mm.
- E46.6.3 Sand: hard fine silica sand, well washed and free of impurities, chemical or organic matter. Coarse texture, and to the following gradation:

<u>Particle Size (mm)</u>	<u>% Passing through Screen</u>
2.0	100%
1.0	95 to 100%
0.5	80 to 100%
0.25	0 to 30%
0.15	0 to 8%
0.075	0 to 1%

- E46.6.4 Fertilizer: Synthetic start-up slow release fertilizer with a N-P-K analysis of 12-36-15 ratio at a rate of 4 kg per 100 m<sup>2</sup> which is 8 pounds per 100 sq ft.

E46.7 Construction Method

E46.7.1 Excavation

- (a) Excavate tree vaults by hand unless otherwise directed by Contract Administrator. Dispose of all rock, clay soils and other deleterious materials off Site.
- (b) Protect bottom of excavations against freezing.
- (c) Remove water that has entered the excavated tree pit prior to planting. Notify Contract Administrator if water source is groundwater.
- (d) Verify and obtain approval by Contract Administrator of tree vaults with geotextile prior to compacted soil mound and planting medium placement.

E46.7.2 Planting Medium Placement

- (a) Place planting medium in uniform layers over approved, unfrozen sub-grade, to the depth indicated on the Drawings.
- (b) Eliminate rough spots and low areas, Prepare a loose, friable bed, boot firm and level.

E46.7.3 Soil Amendments

- (a) Apply lime, sulphur, or other soil amendment at a rate determined and recommended from planting medium sample test.
- (b) Mix soil amendment well into full depth topsoil prior to application of fertilizer.

E46.7.4 Finished Grading and Rolling

- (a) Per CW3540.
- (b) Fine grade entire soil area to elevations as indicated on the Drawings. Eliminate rough spots and low areas. Leave surfaces smooth, uniform and firm against foot printing with a fine loose texture.

E46.8 Surplus Material

E46.8.1 Dispose of unused planting medium off Site in accordance with CW1130.

E46.9 Cleaning

E46.9.1 Perform cleaning to remove accumulated environmental dirt from all paved surfaces of building faces. Remove surplus materials, rubbish, tools and equipment barriers.

E46.10 Measurement and Payment

E46.10.1 Supply and placement of planting medium in tree wells will not be measured. This item of Work shall be considered incidental to the cost of "Supply and Installation of Trees" performed in accordance with relevant Specifications and accepted by the Contract Administrator.

E46.10.2 Supply and placement of planting medium for shrub beds to be paid for on an installed volume basis, as accepted by the Contract Administrator, for "Supply and Place Planting Medium for Shrub Beds". Price shall be payment in full for supplying materials and for performing the Work in accordance with this Specification and accepted and measured by the Contract Administrator.

E46.10.3 Supply and placement of planting medium for sod areas will not be measured. This item of Work shall be considered incidental to the cost of "Sodding". No separate measurement or payment will be made.

E46.10.4 Supply and placement of planting medium for naturalized seeding areas will not be measured. This item of Work shall be considered incidental to the cost of "Naturalized Area Seeding". No separate measurement or payment will be made.

**E47. SODDING**

E47.1 Description

E47.1.1 General

- (a) This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3510 "Sodding", and covers all operations relating sod supply and installation, including preparation of finish grade, watering and rolling, and thirty (30) day maintenance.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E47.2 References

E47.2.1 City of Winnipeg Standard Construction Specifications:

- (a) CW 3510 – Sodding
- (b) CW 3540 – Topsoil and Finished Grading

E47.2.2 City of Winnipeg Standard Details:

- (a) SD-243 – Sodding Details

E47.3 Materials

E47.3.1 General

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

E47.3.2 Turf Grass Sod

- (a) Turf grass sod shall conform to CW 3510.
- (b) Sod shall be a mixture of ninety-five percent (95%) Kentucky bluegrass, using equal proportions of any three (3) Class 2 cultivars, and five percent (5%) Creeping Red fescue.
- (c) Soil and fine grading shall conform to CW 3540 and Planting Medium & Finish Grading Specification.

E47.4 Construction Methods

E47.4.1 Installation of Topsoil and Finish Grading, Preparation of Finish Grade, Placement of Sod, Watering, Rolling and 30-Day Maintenance:

- (a) Install 75 mm topsoil in accordance with CW 3540.
- (b) Sod placement, watering and rolling and thirty (30) day maintenance shall conform to CW 3510-R9 and SD-243.
- (c) Install one width of sod, 600mm, along all sidewalks, roadways and active transportation pavements in naturalized areas.

E47.5 Measurement and Payment

E47.5.1 Turf Grass Sod

- (a) Turf Grass Sod will be measured on an area basis and paid for at the Contract Unit Price per square metre for Items of Work listed below measured as specified herein, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification and accepted and measured by the Contract Administrator.

- (i) Items of Work:

- ◆ Sodding width greater than or equal to 600mm.

E47.5.2 Payment for each item of work for supply and installation of sod shall include thirty (30) day maintenance before acceptance in accordance with CW 3510.

E47.5.3 Payment shall be in accordance with the following:

- (a) Seventy-five percent (75%) of quantity following supply and placement of sodding including topsoil depth.
- (b) Twenty-five percent (25%) of quantity following termination of the thirty (30) day maintenance period.

**E48. NATURALIZED AREA SEEDING**

E48.1 Description

E48.1.1 This specification shall cover sub-grade preparation and the supply and placement of seed at locations designated for naturalized area seeding.

E48.2 References

E48.2.1 City of Winnipeg Standard Construction Specifications:

- (a) CW 3520 – Seeding
- (b) CW 3540 – Topsoil and Finish Grading for Establishment of Turf Areas

E48.3 Submittals

E48.3.1 Submit product data for:

- (a) For each type of seed mix provide the following:
  - (i) % of pure seed by weight.
  - (ii) % of germination or % of pure live seed.
  - (iii) Year of seed production
  - (iv) Seed Tags Stating:
    - ◆ Date when tagged,
    - ◆ Location,
    - ◆ Weight,
    - ◆ Name and address of distributor, and
- (b) Fertilizer.

E48.4 Materials

E48.4.1 Topsoil: refer to planting Medium & Finished Grading Specification.

E48.4.2 Naturalized Seed Mix:

E48.4.3 <u>Common name</u>	<u>Latin name</u>	<u>% by weight</u>
E48.4.4 Northern wheatgrass	<i>Agropyron dasystachym</i>	8%
E48.4.5 Big bluestem	<i>Agropyron gerardii</i>	20%
E48.4.6 Western wheatgrass	<i>Agropyron smithii</i>	10%
E48.4.7 Slender / Awned wheatgrass	<i>Agropyron trachycaulum</i>	5%
E48.4.8 Canadian wild rye	<i>Elmus Canadensis</i>	15%
E48.4.9 Switchgrass	<i>Panicum virgatum</i>	8%
E48.4.10 Fowl bluegrass	<i>Poa palustris</i>	4%
E48.4.11 Green needle grass	<i>Stipa viridula</i>	30%

E48.4.12 Wet Seed Mix:

E48.4.13 <u>Common name</u>	<u>Latin name</u>	<u>% by weight</u>
E48.4.14 Fowl bluegrass	<i>Poa palustris</i>	25%
E48.4.15 Ticklegrass	<i>Agrostis scabra</i>	20%
E48.4.16 Big bluestem	<i>Agropyron gerardii</i>	15%
E48.4.17 Canadian wild rye	<i>Elmus Canadensis</i>	10%
E48.4.18 Turfed hairgrass	<i>Deschampsia cespitosa</i>	30%

E48.5 Equipment

E48.5.1 Scarification equipment shall be suitable for the area being scarified, shall be capable of scarifying the sub-grade to the specified depth and shall be accepted by the Contract Administrator. For confined areas a toothed bucket may be acceptable. For larger areas tilling equipment may be required.

E48.6 Construction Methods

E48.6.1 Preparation of Existing Grade

- (a) Prior to placing topsoil, in areas to be seeded greater in width than 600mm, prepare the existing sub-grade by scarifying to a minimum depth of 75mm and to a maximum depth of 100mm to the satisfaction of the Contract Administrator.
- (b) Scarification shall consist of breaking up and loosening the sub-grade. No scarification shall occur within the edge of a tree canopy (or drip line).

E48.6.2 Placement of Planting Medium

- (a) Depth and placement of planting medium in accordance with Planting Medium Specification.

E48.7 Maintenance

E48.7.1 Commencement of maintenance period per CW 3520.

E48.7.2 Maintenance of seeded area per CW 3520.

E48.7.3 Spring clean-up per CW 3520.

E48.7.4 Termination of maintenance period per CW 3520.

E48.8 Site Clean-Up

E48.8.1 Per CW 3520.

E48.9 Measurement and Payment

E48.9.1 Supply, placement and maintenance of Naturalized Seed Mixes will be paid for at the Contract Unit Price per square metre for the Items of Work listed below, measured as specified herein, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification and accepted and measured by the Contract Administrator.

E48.9.2 Items of Work:

- (a) Naturalized Seed Mix
- (b) Wet Seed Mix

E48.9.3 Payment for Naturalized Area Seeding shall be in accordance with the following:

- (a) Sixty five percent (65%) of quantity following supply and placement.
- (b) Remaining thirty five percent (35%) of quantity following termination of maintenance period.

**E49. TREES, SHRUBS & PERENNIAL PLANTINGS**

E49.1 Description

E49.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and installation of trees, shrubs, perennials, and wood chip mulch.

E49.2 References

E49.2.1 Agriculture and Agri-Food Canada (AAFC)

- (a) Plant Hardiness Zones in Canada-2000.

E49.2.2 Canadian Nursery Landscape Association (CNLA)

- (a) Plant Canadian Standards for Nursery Stock-2001.

E49.2.3 Department of Justice Canada (JUS)

- (a) Plant Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- (b) Transport of Dangerous Goods Act (TDGA), 1992, c.34.

- E49.2.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)  
(a) Materials Safety Data Sheets (MSDS).
- E49.3 Submittals
- E49.3.1 Submit product data for:  
(a) Fertilizer.  
(b) Wood mulch.
- E49.3.2 Submit samples for:  
(a) Wood mulch.
- E49.4 Source Quality Control
- E49.4.1 Obtain approval from Contract Administrator of plant material at source.
- E49.4.2 Notify Contract Administrator of source of material at least seven (7) days in advance of shipment. No work under this Section is to proceed without approval.
- E49.4.3 Acceptance of plant material at source does not prevent rejection on Site prior to or after planting operations.
- E49.4.4 Plant material imported from other nations will not be accepted.
- E49.4.5 Bare root plant material will not be accepted.
- E49.5 Storage and Protection
- E49.5.1 Coordinate the shipping of plants and excavation of tree vaults to ensure minimum time laps between digging and planting.
- E49.5.2 Protect plant material from frost, excessive heat, wind and sun during delivery.
- E49.5.3 Protect plant material from damage during transportation:  
(a) When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.  
(b) When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.  
(c) Protect foliage and rootballs using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- E49.5.4 Protect stored plant material from frost, wind and sun as follows:  
(a) For balled and burlapped and wire basket rootballs, place to protect branches from damage. Maintain moisture level in root zones.
- E49.5.5 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 20mm (3/4") diameter with wound dressing.
- E49.5.6 Keep roots moist and protect from sun and wind. Heel-in trees that cannot be planted immediately in shaded areas and water well.
- E49.6 Scheduling
- E49.6.1 Order plant material as soon as possible after award of contract to ensure plant availability. Request substitutes as required.
- E49.6.2 Provide Contract Administrator a written schedule fourteen (14) days in advance of shipment of plant material. Schedule to include: quantity and type of plant material, shipping dates, arrival dates on Site, and planting dates.
- E49.7 Warranty of Nursery Stock
- E49.7.1 For all plant material a two (2) year warranty period is required.

- E49.7.2 During the warranty period, upon written notification from the Contract Administrator, the Contractor warrants to replace and replant any nursery stock found dead and/or in poor condition as soon as possible thereafter, without cost to The City. "Poor Condition" shall be interpreted as meaning nursery stock on which branches are dead or dying, or have not shown satisfactory growth in leaves. Exempted is nursery stock damaged by accidental causes or vandalism, which stock shall be replaced at the cost of The City.
- E49.7.3 At the end of the two (2) year warranty period an inspection will be conducted by Contract Administrator.
- E49.7.4 Contract Administrator reserves the right to extend Contractor's warranty responsibilities for an additional one (1) year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.
- E49.8 Replacements
- E49.8.1 During warranty period, remove and replace any plant material that has died or failed to grow satisfactorily, at no cost to the City, as directed by the Contract Administrator.
- E49.8.2 A two (2) year warranty period shall be required on all replacement plant material.
- E49.8.3 All replacement plant material shall be the same size and species as specified, and shall be supplied and planted in accordance with the original Drawings and Specifications.
- E49.8.4 Should the replaced plant material not survive, the Contractor will be responsible for a third replacement and a two (2) year warranty period shall be required.
- E49.9 Plant Material
- E49.9.1 Type of root preparation, sizing, grading and quality shall comply to the Canadian Standards for Nursery Stock.
- E49.9.2 Source of plant material: grown in Zone 3 only in accordance with Plant Hardiness Zones in Canada. Plant material must be planted in zone indicated as appropriate for its species.
- E49.9.3 Plant material free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- E49.9.4 Substitutions to plant material as indicated on planting plan are not permitted unless written approval has been obtained as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.
- E49.9.5 Refer to Plant Specification List on the Drawings and the Drawings for species, quantities, size and quality of plant materials.
- E49.10 Water
- E49.10.1 Water free of impurities that would hinder plant growth. The Contractor shall provide water, so that all costs to provide water for the watering operation and all associated costs shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.
- E49.10.2 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-law. Sewer charges will not be assessed for water obtained from a hydrant.
- E49.11 Planting Medium: backfill with planting medium as specified in Planting Medium Specification.
- E49.12 Stakes: 76mm dia. x 2440mm ht. wooden stakes.
- E49.13 Heavy Duty Baler Twine: Polypropylene baler twine, UV protected.
- E49.14 Tree Tie: biodegradable or polyethylene fabric strapping min. 38mm wide.
- E49.15 Guying Wire: 9 gauge, flexible, non-corrosive strand wire.

- E49.16 Wire Tightener: PG wire tightener.
- E49.17 Clamps: U- bolt: galvanized, 12mm (1/2")  $\varnothing$ , c/w curved retaining bar and hex nuts.
- E49.18 Anchor: Drive-in Type: 12mm (1/2")  $\varnothing$  x 300mm (12") long, aluminum.
- E49.19 Tree Protection: Plastic, 13 mm  $\varnothing$ , nylon reinforced garden hose over guy wire.
- E49.20 Wood Chip Mulch: wood chip mulch varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark. Wood chip shall be mulched locally within 80 km of the Site.
- E49.21 Fertilizer: synthetic start-up slow release fertilizer with a N-P-K analysis of 12-36-15 ratio at a rate of 4 kg per 100 m<sup>2</sup> which is 8 pounds per 100 sq ft.
- E49.22 Pre-Planting Preparation
- E49.22.1 Obtain approval from Contract Administrator of finish grading, and planting medium installation prior to commencing Work in this section.
- E49.22.2 Ensure plant material is acceptable to the Contract Administrator.
- E49.22.3 Remove damaged roots and branches from plant material with sharp clean equipment treating wounds as necessary to maintain plant health.
- E49.22.4 Apply anti-desiccant to deciduous trees in leaf in accordance with manufacturer's instructions.
- E49.23 Plant Material Layout
- E49.23.1 Prepare planting beds. Refer to Planting Medium Specification.
- E49.23.2 For individual trees:
- Stake out locations of all trees and obtain approval from Contract Administrator prior to excavating tree pits.
  - Excavate tree pits to depths and widths indicated on the Drawings.
  - Remove rocks, roots, debris and toxic material from the tree pit.
- E49.23.3 For shrubs and perennials:
- Prepare planting beds. Refer to Planting Medium Specification.
  - Lay out plants as indicated on the Drawings and ensure spacing as specified.
  - Obtain Contract Administrator approval of plant layouts and make any necessary adjustments on Site.
- E49.23.4 Remove water that has entered the excavated tree pit prior to planting. Notify Contract Administrator if water source is groundwater.
- E49.24 Planting
- E49.24.1 For jute burlap rootballs, cut away top one third of wrapping and wire basket without damaging rootball. Do not pull burlap or rope from under rootball.
- E49.24.2 For container stock or rootballs in non-degradable wrapping, remove entire container or wrapping without damaging rootball. Loosen rootball to encourage bonding with planting medium and subgrade.
- E49.24.3 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- E49.24.4 For trees, shrubs and shrubs:
- Backfill soil in 150 mm (6") lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.

(b) Form watering saucer as indicated on the Drawings.

E49.24.5 For Perennials: backfill soil evenly to finished grade and tamp to eliminate air pockets.

E49.24.6 Water plant material thoroughly. Report extreme ponding in planters indicative of malfunctioning drains to the Contract Administrator immediately.

E49.24.7 After soil settlement has occurred, fill with soil to finish grade.

E49.24.8 Dispose of burlap, wire and container material off Site.

#### E49.25 Tree Supports

E49.25.1 Install tree supports as indicated on the Drawings taking care not to damage or puncture underground utilities.

E49.25.2 Use double stake tree support for deciduous trees:

(a) Place first stake on prevailing wind side of tree trunk.

(b) Drive stakes minimum 150mm into undisturbed soil beneath bottom of roots. Ensure stakes are secure, vertical and unsplit.

(c) Install tree tie 1500mm above grade.

#### E49.26 Pruning

E49.26.1 Undertake corrective pruning after planting to eliminate torn and broken branches. Do not damage lead branches or remove smaller twigs along main branches. Do not prune to compensate for root loss.

#### E49.27 Mulching

E49.27.1 Obtain approval of planting placement from Contract Administrator before mulching material is applied.

E49.27.2 Ensure soil settlement has been corrected prior to mulching.

E49.27.3 Spread wood chip mulch as indicated on all planting beds. Spread mulch to minimum thickness of 75mm.

#### E49.28 Maintenance

E49.29 Maintain plant material from date of planting to the end of the warranty period. Refer to Landscape Maintenance Specification.

#### E49.30 Measurement and Payment

E49.30.1 Supply and installation of trees, shrubs and perennials will be measured on a unit basis, and will be paid for at the Contract Unit Price per unit for installed plants, as accepted and measured in the field by the Contract Administrator, for the following Items of Work, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E49.30.2 Items of Work:

(a) Trees

(i) Manitoba Maple

(ii) Basswood

(iii) Trembling Aspen

(iv) American Elm

(b) Shrubs

(i) Pygmy Carrigana

(ii) Miss Kim Lilac

(c) Perennials

(i) Karl Foerester Reed Grass

E49.30.3 Wood chip mulch will be measured on a square metre basis and paid for at the Contract Unit Price per unit as "Wood Chip Mulch" in accordance with this specification and accepted and measured by the Contract Administrator.

**E50. LANDSCAPE MAINTENANCE**

E50.1 Description

E50.1.1 Provide all labour, materials, methods, equipment and accessories for the maintenance of trees, shrubs, groundcovers and perennials following acceptance of the plant material to start warranty.

E50.1.2 In general, the Work shall include:

- (a) Fertilizing
- (b) Watering
- (c) Weed Control
- (d) Pest and disease Control
- (e) Winter Preparation

E50.1.3 Maintenance shall be performed on an as required basis.

E50.2 Maintenance and Warranty Period

E50.2.1 Thirty (30) days after the planting installation has been completed, the Contract Administrator shall perform an inspection of the plant material to determine if the plant material is acceptable to start warranty.

E50.2.2 The maintenance and warranty period shall begin following acceptance of plant material by Contract Administrator and shall be for a period of two (2) years.

E50.3 Materials and Equipment

E50.3.1 Materials shall conform to the requirements of related Specification sections.

E50.3.2 Provide all equipment to properly execute Work. Maintain such equipment in a workable, safe condition while in use during this project.

E50.3.3 Contract Administrator shall review equipment to be used to execute Work prior to execution.

E50.4 Method

E50.4.1 General

- (a) Provide watering service within 24 hours, weeding services within 48 hours of the request by the Contract Administrator. Monitor the Site and advise the Contract Administrator of conditions that might void the Contractor's warranty responsibilities.
- (b) The Contractor shall maintain a log noting times, dates, equipment used, and quantity of materials used and areas treated for each maintenance application. Forms shall be provided by Contract Administrator. Submit log to Contract Administrator upon request. Contractor shall notify Contract Administrator of the exact time Contractor proposes to commence each application.
- (c) Schedule operations in accordance with growth, health, weather conditions, and use of Site.
- (d) Perform each operation continuously and completely within a reasonable time period.
- (e) Store equipment and materials off Site.
- (f) Collect and dispose of debris or excess material on the day the maintenance is undertaken.

- E50.4.2 Maintenance of Trees, Shrubs, Groundcovers, Vines, and Perennials:
- (a) Fertilizing: Apply fertilizer only at frequency, ratio and rates as recommended by manufacturer. Water immediately after fertilizing. Apply fertilizer no later than May 30th of each maintenance year.
  - (b) Watering: Apply water as required to supplement rainfall and to maintain optimum growing conditions. In general, water once a week to achieve rates as indicated. Allow soil to adequately dry between watering to prevent over saturation without creating water stress. Subject to the above-noted requirements, the Contractor must water at least once a week between May 1st and October 15th inclusive. A complete record is to be kept of each series of waterings for all planted trees noting location and date of watering. This record is to be given to the Contract Administrator when requested. Apply 40 litres of water per 25 mm calliper per application using a deep root feeder or low pressure open flow nozzle and hose. The water stream must not gouge the soil and mulch.
  - (c) Weed Control: Inspect and undertake weed control weekly during the first year of maintenance and monthly during the second year. By hand, remove all weeds with their roots from tree pits and tree beds and dispose of off Site. When weeding operation is complete, replace and rake displaced mulch to its original condition.
  - (d) Pests and Diseases: Obtain written approval of Contract Administrator prior to using any pesticide. Control pests and disease through pruning or application of pesticides. Use species specific pesticides where possible. Use only pesticides of low mammalian toxicity. Strictly follow manufacturer's written instructions.
  - (e) Pruning: The Contractor shall provide a person with a Manitoba Arborists Certificate for each work crew or Work Site. Prune as required to remove dead, broken or damaged limbs. Prune back to healthy growth while maintaining balanced crown shape. Employ clean sharp tools. Make cuts smooth and flush with outer edge of branch collar near the main stem or branch. Cuts must be smooth and sloping to prevent accumulation of water on cut. Do not leave little stumps ("horns") on trunks or main branches. Prune according to accepted horticultural practices as outline in "The Pruning Manual", Publication No. 1505-1977 by Agriculture Canada.
  - (f) Winter Preparation: Ensure adequate moisture in tree root zones prior to freeze-up.

E50.5 Measurement and Payment

E50.5.1 Landscape maintenance shall be paid for on a lump sum basis for the items of work listed below. Price shall be payment in full for supplying all material and performing all operations herein described and all other items incidental to the Work included in this Specification.

E50.5.2 Items of Work:

- (a) Landscape Maintenance Year 1
- (b) Landscape Maintenance Year 2

## STRUCTURAL

### E51. SUPPLYING AND PLACING REINFORCING STEEL

E51.1 Description

- (a) This Specification shall cover all operations relating to the supply, fabrication, and placement of black and stainless reinforcing steel, and associated bar accessories, as specified herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

## E51.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes;
  - (ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
  - (iii) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement;
  - (iv) ASTM C881/C881M-15 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;
  - (v) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
  - (vi) CAN/CSA G30.18 – Billet-Steel Bars for Concrete Reinforcement;
  - (vii) Reinforcing Steel Institute of Canada (RSIC) – Reinforcement Steel Manual of Standard Practice.

## E51.3 Scope of Work

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

## E51.4 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the Shop Drawings including bar lists, and the mill certificates for black steel reinforcing.
- (c) The Contractor submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the Shop Drawings including bar lists, and the mill certificates for stainless steel reinforcing.
- (d) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor, and the qualifications of Operators, the Shop Drawings including bar lists, and the mill certificates, including corrosion test results in accordance with ASTM A955M.
- (e) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.
- (f) Shop Drawings shall be submitted in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

## E51.5 Materials

### E51.5.1 General

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

### E51.5.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition and all subsequent revisions of CAN/CSA-A23.1, "Storage of Materials", except as otherwise specified herein.
- (b) Bundles of reinforcing steel shall be identified by tags containing bar marks.
- (c) The Contractor shall handle and store the reinforcing steel in a manner that ensures it is not damaged or contaminated with dirt or other materials.
- (d) The reinforcing steel shall not be placed directly on the ground. Timber pallets shall be placed under the reinforcing steel to keep them free from dirt and mud and to provide easy handling.

E51.5.3 Handling and Storage of Stainless Steel Reinforcing

- (a) Stainless steel reinforcing shall be stored separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.
- (b) Chains or steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Use wood or other soft material to protect the bars, or use nylon or polypropylene slings.
- (c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.
- (d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

E51.5.4 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) Reinforcing steel for the under bridge pathway, retaining walls, slope paving, stairway, and pathway as shown on the Drawings shall conform to the requirements of CAN/CSA G30.18, Grade 400W.
- (c) All other reinforcing steel shall be stainless steel, a high-manganese, low-nickel, nitrogen-strengthened austenitic stainless steel. Stainless steel reinforcing shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E51.1, "Type of Stainless Steel Reinforcing".
- (d) Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimensions recommended by RSIC.
- (e) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.
- (f) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross sectional area, and tensile properties of a hand-wire-brushed specimen are not less than the requirements of ASTM A955M.

Table E51.1 Type of stainless steel reinforcing		
Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205 Duplex	2205	S32205
Type 2304 Duplex	2304	S32304

#### E51.5.5 Bar Accessories

- (a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.
- (c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.
- (d) Placing of bar supports shall be done to meet the required construction loads.
- (e) Tie wire shall be the following:
  - (i) Black, soft-annealed 1.6 mm diameter wire for black steel reinforcing.
  - (ii) Nylon-, epoxy-, or plastic-coated wire for black steel reinforcing; and
  - (iii) Stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel or epoxy coated reinforcing.
- (f) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

#### E51.6 Equipment

##### E51.6.1 General

- (a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.
- (b) All tools used for stainless steel reinforcing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

#### E51.7 Construction Methods

##### E51.7.1 Fabrication of Reinforcing Steel

- (a) All reinforcing steel shall be fabricated in accordance with the latest edition of CAN/CSA G30.18M and the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.
- (b) Black steel reinforcing shall be bent to the proper shape in a plant that has suitable devices for bending as recommended in Reinforcing Steel Institute of Canada (RSIC) Manual of Standard Practice.
- (c) Black steel reinforcement bars shall be bent at temperatures between 10°C and 100°C.
- (d) Heating shall not be used as an aid in bending of low carbon chromium steel reinforcing. The equipment used in the plant shall not cause any surface contamination or damage to the surface of the bars. Bar cutting shall be done by shearing or with a water-cooled saw. Torch cutting shall not be permitted.

##### E51.7.2 Fabrication of Stainless Steel Reinforcing

- (a) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and non-stainless steels.
- (b) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or

oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel brushes only.

- (c) All hand tools shall be stainless tools that have not been previously used on carbon steel.
- (d) Heating shall not be used as an aid in bending stainless steel reinforcing.
- (e) Hooks and bends should be smooth and not sharp.

### E51.7.3 Placing and Fastening of Reinforcing Steel

#### (a) General

- (i) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.
- (ii) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.
- (iii) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.
- (iv) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.
- (v) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used.
- (vi) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.
- (vii) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.
- (viii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel shall be as specified in E51.5.5- "Bar Accessories".
- (ix) Welding or tack welding is not permitted.
- (x) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.
- (xi) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.
- (xii) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the placing of any concrete to allow for inspection of the reinforcement.

#### (b) Placing Stainless Steel Reinforcing

- (i) Stainless steel reinforcing will be rejected if:
  - (ii) • Any area of contamination of the stainless steel by iron exceeds 100 mm in length;
  - (iii) • Two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or
  - (iv) • There are frequent small occurrences of rust contamination along the full length of the bar.

- (v) If stainless steel reinforcing bars have been rejected due to excessive iron contamination, the Contractor may attempt to treat the bar to remove the contamination. This treatment can be accomplished by mechanical cleaning with a (stainless steel) wire brush, or by a polishing machine, or by chemical treatment (pickling). If the treatment(s) are not successful, the contaminated bar(s) shall be replaced at no cost to the City.
- (vi) If the stainless steel reinforcing is mechanically damaged, the bars will be rejected and the Contractor shall replace the rejected bars at no cost to the City. Any cuts into a bar, sharp tears, or flattening of the deformations on the bars will be cause for rejection.
- (vii) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.
- (viii) All tools used for placing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.
- (ix) For lapping steel reinforcing bars at the joints and intersection, an ample supply of stainless steel wire shall be provided. The wire shall not be contaminated with non stainless steel.
- (x) Proper stainless steel cutting pliers shall be used and the bending and tying of the wires done as neatly as possible.
- (xi) Twisted ends of the tie wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcing steel.

#### E51.7.4 Splicing

##### (a) General

- (i) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings will not be permitted without the written approval of the Contract Administrator.
- (ii) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of forty-five (45) bar diameters lap length shall be provided.

#### E51.7.5 Installing Reinforcing Steel into Hardened Concrete

- (a) The Contractor shall drill holes into adjacent slabs for hooks of the diameters and depths specified for each size of reinforcing steel, as shown on the Drawings. Drill bits shall have a diameter no larger than 2 mm larger than the nominal dowel, tie bar, or stud diameter.
- (b) Holes shall be located to the correct depth and alignment as indicated on the Drawings. The spacing of the holes shall be as per RSIC.
- (c) Drilling equipment shall be operated so as to ensure that no damage to the pavement results from such drilling operation. Coring of holes is not permitted. In the event that existing reinforcing steel bars are hit during the drilling operations, the hole shall be abandoned and a new hole shall be drilled nearby to the correct depth. All abandoned holes shall be filled with non-shrink grout.
- (d) Holes for reinforcing steel shall be blown clean with compressed air. Bonding agent shall be placed in the back of the drilled hole. The reinforcing steel shall be worked back into the holes for complete coverage around the portion of the bar that extends into the hole, such that bonding agent is squeezed from the hole.
- (e) Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any new concrete is placed. Otherwise, the concrete may be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

#### E51.7.6 Dissimilar Metals in Concrete

- (a) Where the presence of dissimilar metals is present between adjacent miscellaneous or structural steels, polyethylene spacers shall be provided, as approved by the Contract Administrator.
- (b) Provide a minimum 25mm cover between dissimilar metals.

## E51.8 Quality Control

### E51.8.1 Inspection

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.
- (c) A minimum of one (1) Business Day advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcing steel.
- (d) After all reinforcing steel has been placed; a final inspection shall be made prior to the placement of concrete to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Contract Administrator before concrete is placed.

### E51.8.2 Access

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

## E51.9 Quality Assurance

### E51.9.1 Testing

- (a) Quality Assurance testing shall be used to determine the acceptability of the reinforcing steel supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of reinforcing steel required for Quality Assurance Tests and provide such assistance and use of tools and construction equipment as is required.

## E51.10 Measurement and Payment

### E51.10.1 Supplying Reinforcing

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

Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The mass to be paid for shall be the total number of kilograms of stainless steel reinforcing supplied in accordance with this Specification, as accepted by the Contract Administrator, as computed from the reviewed Shop Drawings, excluding the mass of bar accessories.

#### E51.10.2 Placing Reinforcing

##### (a) Black Steep Reinforcing

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

##### (b) Stainless Steel Reinforcing

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

### **E52. STRUCTURAL CONCRETE**

#### E52.1 Description

- (a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings, which include Bridge deck, Traffic Barriers, sidewalk pathway and curb, Expansion joints, slope pavement, retaining wall, stairway, stairway curb, and stairway landing pad, and overhead sign pile.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

#### E52.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) ACI 309 – Guide for Consolidation of Concrete;
  - (ii) ACI 347 – Guide to Formwork for Concrete;
  - (iii) American Concrete Publication SP4 – Formwork for Concrete;
  - (iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;
  - (v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
  - (vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;
  - (vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

- (viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;
  - (ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;
  - (x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;
  - (xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;
  - (xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;
  - (xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);
  - (xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);
  - (xv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
  - (xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;
  - (xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;
  - (xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;
  - (xix) CAN/CSA O121 – Douglas Fir Plywood;
  - (xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;
  - (xxi) CAN/CSA S269.1 – False Work for Construction Purposes;
  - (xxii) CAN/CSA S269.3 – Concrete Formwork;
  - (xxiii) ICRI Guideline No. 310.2R-2013 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair;
  - (xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and
  - (xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.
- (b) The following specifications:
- (i) E54 – Structural Removals;
  - (ii) E51 – Reinforcing Steel;

### E52.3 Scope of Work

- (a) The Work under this Specification shall involve the following structural concrete Works:
- (i) Bridge deck;
  - (ii) Bridge traffic barriers;
  - (iii) Bridge sidewalk;
  - (iv) Underbridge Pathway and Slope Paving;
  - (v) Stairway Modifications
  - (vi) Overhead Sign Structure Foundations

### E52.4 Submittals

#### E52.4.1 General

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

#### E52.4.2 Concrete Mix Design Requirements

- (a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website ([www.mrmca.com](http://www.mrmca.com)). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).
- (b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:
  - (i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;
  - (ii) Designated size, or sizes, of aggregates, and the gradation;
  - (iii) Aggregate source location(s);
  - (iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;
  - (v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;
  - (vi) The limits for slump;
  - (vii) The limits for air content; and
  - (viii) Quantity of other admixtures.
- (c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.
- (d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.
- (e) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

#### E52.4.3 Concrete Mix Design Test Data

- (a) Concrete
  - (i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.
  - (ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (R<sub>i</sub>) and fibre dispersion in accordance with the requirements of the Canadian Highway

- Bridge Design Code (CHBDC) CAN/CSA-S6, Section 15, Fibre Reinforced Structures, Clause 16.6. Testing for  $R_i$  of concrete shall be completed in accordance with E16.8.5(d)
- (iii) Testing for air void system shall be completed in accordance with E52.8.5(c).
  - (iv) Testing for rapid chloride permeability shall be completed in accordance with E52.8.5(c).
  - (v) Testing for flexural strength of concrete reinforced with fibres shall be completed in accordance with ASTM C1609.
  - (vi) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.
- (b) Aggregates
- (i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.
  - (ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.
  - (iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.
  - (iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.
  - (v) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.
  - (vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.
  - (vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.
- (c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

#### E52.4.4 Notification of Ready Mix Supplier

- (a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix

design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

#### E52.4.5 Temporary False Work, Formwork and Shoring Works

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.
- (b) Design Requirements
  - (i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.
  - (ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.
  - (iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the steel box girders will not be accepted. Any inserts to remain the structure must be non-rusting and not dissimilar to metals within the structural element.
  - (iv) The loads and lateral pressures outlined in Part 3, Section 102 of ACI 347 and wind loads as specified by the Manitoba Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.
  - (v) As a minimum, the following spacings shall apply, for studding and waling:
    - ◆ 20-mm plywood: studding 400 mm centre to centre (max.),
    - ◆ Walers 760 mm centre to centre (max.)
  - (vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.
  - (vii) Formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
  - (viii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.
  - (ix) Shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
  - (x) Mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
  - (xi) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

- (xii) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
  - (xiii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
  - (xiv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.
- (c) Shop Drawings shall show design loads, method of construction, type and grade of materials, and any further information required by the Contract Administrator. Shop drawings for temporary works shall clearly demonstrate the structural system, including size and spacing of the components of the temporary works expressed in sufficient detail to understand the load path from the point of loading to the point of support. The shop drawings shall clearly demonstrate any temporary or permanent connections to the permanent structure, any temporary or permanent loads to be supported by the permanent structure or near enough to the permanent structure such that their load path may be introduced to the permanent structure, and any components proposed to remain behind with the permanent structure. The shop drawings shall clarify provisions of the temporary works incorporated to obtain the correct permanent structure geometry and grade.
- (d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

## E52.5 Materials

### E52.5.1 General

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

### E52.5.2 Handling and Storage of Materials

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

### E52.5.3 Concrete

- (a) Concrete materials susceptible to frost damage shall be protected from freezing.
- (b) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table E52.1.

<b>Table E52.1</b>						
<b>Requirements for Hardened Concrete</b>						
<b>Type of Concrete</b>	<b>Location</b>	<b>Nominal Compressive Strength MPa</b>	<b>Class of Exposure</b>	<b>Air Content Category</b>	<b>Max Aggregate Size</b>	<b>Minimum Post Residual Cracking Index</b>
Type 1	Slope Paving, Retaining Walls, Pathways	35 @ 28 days	C-1	1	20 mm	TBD
Type 2	Deck Slab, Bridge Traffic Barrier	35 @ 28 days	C-2	1	20 mm	
Type 3	Bridge Sidewalk Topping	35 @ 28 days	C-2	1	10 mm	
Type 4	Overhead Sign Structure Piles	35 @ 56 days	S-1	2	25 mm	

E52.5.4

Aggregates

(a) General

- (i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.
- (ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.
- (iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

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

(c) Coarse Aggregate - Standard

- (i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.
- (ii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.
- (iii) Course aggregate when tested for abrasion in accordance with the requirements of the ASTM C131 shall not have a loss greater than 30%.
- (iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

#### E52.5.5 Admixtures

- (a) Air-entraining admixtures shall conform to the requirements of ASTM C260.
- (b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.
- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

#### E52.5.6 Cementitious Materials

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

#### E52.5.7 Water

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

#### E52.5.8 Corrosion Inhibitor

- (a) Corrosion inhibitor shall be MCI 2005 NS at a dosage of 1 L/m<sup>3</sup>, or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

#### E52.5.9 Synthetic Fibres

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

#### E52.5.10 Formwork

- (a) Formwork materials shall conform to CAN/CSA A23.1, and American Concrete Publication SP4, "Formwork for Concrete."
- (b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.
- (c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CAN/CSA "O121". Approved Manufacturers are "Evans" and "C-Z."
- (d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a nonrusting material or galvanized steel. They shall not stain, blemish, or spall the concrete surface for the life of the concrete. Where there may be interaction between stainless steel reinforcing and formwork accessories, accessories should also be stainless steel. Black steel accessories will not be considered acceptable for any exposed surfaces.
- (f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.
- (h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.
- (i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

#### E52.5.11 Form Coating

- (a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, "Clean Strip" by Dayton Superior or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

#### E52.5.12 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes". This formwork liner shall be used on all exposed substructure and superstructure formed surfaces.

#### E52.5.13 Curing Compound

- (a) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.
- (b) Type 2 shall only be used on surfaces that will not be exposed to view.
- (c) An approved product is WR Meadows 1215 WHITE Pigmented Curing Compound, or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

#### E52.5.14 Curing Blankets

- (a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour. An approved product is "Mirafi Geotextile P150". Alternately, a 10 oz burlap, 5 mil polyethylene, curing blanket white in colour shall be used; "Curelap" manufactured by Midwest Canvas, together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

#### E52.5.15 Sealing Compounds

- (a) An approved Type 1c Silane sealer shall be applied to all exposed new cast-in-place structural concrete surfaces; excluding the sidewalk surface along the pathway. An approved product is "Sikagard SN100" or equal as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.** "substitutes"

#### E52.5.16 Bonding Agents

- (a) Latex Bonding Agent
  - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.
  - (b) Bonding Grout
    - (i) The grout for bonding all hardened concrete surfaces to fresh concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
      - ◆ 1 part water;
      - ◆ 1 part latex bonding agent; and
      - ◆ 1 1/2 parts Type GUSF Portland cement.
    - (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

#### E52.5.17 Epoxy Adhesive

- (a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concessive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with, **Error! Reference source not found.** "Substitutes".

#### E52.5.18 Epoxy Grout

- (a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with, **Error! Reference source not found.** "Substitutes".

#### E52.5.19 Cementitious Grout

- (a) Cementitious grout shall be nonshrink and nonmetallic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with, B7 "Substitutes". The minimum compressive strength of the grout at 28 days shall be 40 MPa.

#### E52.5.20 Patching Mortar

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

#### E52.5.21 Flexible Joint Sealant

- (a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are

Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".

E52.5.22 Fibre Joint Filler

- (a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".

E52.5.23 Precompressed Foam Joint Filler

- (a) Precompressed foam joint filler shall be "Emseal BEJS System", satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".
- (b) Precompressed foam joint filler shall be used around roadway approach slabs and approach sidewalk slabs, and shall be used also between barrier joints.
- (c) The sealant system shall be comprise of three components:
  - (i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, waterbased emulsion, factory coated and highway-grade, fuel resistant silicone;
  - (ii) Field-applied epoxy adhesive primer; and
  - (iii) Field-injected silicone sealant bands.
- (d) Impregnation agent shall have proven non-migratory characteristics. Silicone coating shall be highway grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. The depth of seal shall be as recommended by the Manufacturer.
- (e) BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½" (12 mm) down from the substrate surface.
- (f) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plan and direction shall be executed using factory fabricated transition assemblies. Transitions shall be watertight at the inside and outside corners through the full movement capabilities of the product.
- (g) All substitute candidates shall be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be:
  - (i) Capable of withstanding 65C for three (3) hours while compressed down to the minimum movement capability (-50% nominal material size) without evidence of any bleeding of impregnation medium from the materials; and
  - (ii) Capable of self-expanding to the maximum movement capability (+50% nominal material size) within twenty-four (24) hours at 20C.

E52.5.24 Ethafoam Joint Filler

- (a) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application.

E52.5.25 Low Density Styrofoam

- (a) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".

E52.5.26 Backup Rod

- (a) Backup rod shall be preformed compressible polyethylene, urethane, neoprene, or vinyl foam backer road, extruded into a closed cell form and oversized 30 to 50%.

- E52.5.27 Void Form
- (a) Void form shall be supplied by Void Form International, or equal as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".
- E52.5.28 Dampproofing
- (a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
- (b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.
- (c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable products are Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
- E52.5.29 Galvanized Steel Dowels and Expansion Sleeves for Bridge Traffic Barrier Expansion Assembly
- (a) Dowels and expansion sleeves shall be fabricated in accordance with CAN/CSA G40.21, Grade 300W.
- (b) The dowels shall be galvanized in accordance with CAN/CSA G164-M92, to a minimum net retention of 610 g/m<sup>2</sup>.
- (c) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.
- (d) Approved products are:
- (i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and
  - (ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.
- E52.5.30 Miscellaneous Materials
- (a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with **Error! Reference source not found.**, "Substitutes".
- E52.6 Equipment
- E52.6.1 General
- (a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.
- E52.6.2 Vibrators
- (a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular

application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.

- (b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel and stainless steel reinforcing, such as in locations that the existing deck reinforcing is exposed.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

## E52.7 Construction Methods

### E52.7.1 General

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

### E52.7.2 Bridge Deck

- (a) Bridge deck works shall comprise of the Work associated with the cast-in-place concrete bridge deck modifications.

### E52.7.3 Bridge Traffic Barrier

- (a) Bridge traffic barrier works shall comprise of the Work associated with the cast-in place concrete Bridge traffic barriers on the Bridge deck, on the abutments, and on the approach slabs.

### E52.7.4 Bridge Sidewalk

- (a) Bridge sidewalk works shall comprise of the Work associated with the cast-in-place concrete sidewalk topping on the bridge and for the approaches.

### E52.7.5 Underbridge Pathway

- (a) Underbridge pathway works shall comprise of the Work associated with the cast-in-place concrete pathway, slope paving modifications, and shear keys, along the bridge headslopes.

### E52.7.6 Temporary False Work, Formwork, and Shoring

- (a) Construction Requirements
  - (i) The Contractor shall construct false work, formwork and shoring for new concrete strictly in accordance with the accepted Shop Drawings.
  - (ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.
  - (iii) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted Shop Drawings.
  - (iv) Forms shall be constructed and maintained so that the completed Work is within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.
  - (v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
  - (vi) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.
  - (vii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
  - (viii) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be

- adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
- (ix) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.
  - (x) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
  - (xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
  - (xii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
- (b) Form panels shall be constructed so that the contact edges are kept flush and aligned.
  - (c) The geometry shall be as shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.
  - (d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.
  - (e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.
  - (f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour to match the surrounding concrete.
  - (g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
  - (h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.
  - (i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.
  - (j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

#### E52.7.7 Concrete Construction Joints

- (a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction

joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

- (b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.
- (c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.
- (d) Refer to, E52.7.14, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

#### E52.7.8 Bridge Traffic Barrier Joints

- (a) Finishing of Concrete Barrier Joints
  - (i) Finishing of concrete barrier joints shall be completed prior to application of any waterproofing membrane and asphalt overlay.
  - (ii) The installation of the precompressed foam joint filler and fibre joint filler shall be undertaken as shown on the Drawings.
  - (iii) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods. Polyethylene bond breaker tap shall be installed between joint fillers and sealants.
  - (iv) The precompressed foam joint filler shall be installed at barrier joints in accordance with the Manufacturer's recommended methods to fully seal the joint.
  - (v) The supply and installation of all materials required for the barrier joints shall be considered incidental to the Work, and no additional measurement or payment shall be made for this work.

#### E52.7.9 Anchor Units for Aluminum Pedestrian Handrail/Bicycle Rail

- (a) All existing anchor units shall be carefully preserved during the removal of existing aluminum pedestrian handrail posts.
- (b) The Contract Administrator shall be notified a minimum of three (3) days ahead of any existing post removal.
- (c) Any damage to anchors or anchor bolts shall immediately be reported to the Contract Administrator.
- (d) The Contractor shall coordinate the installation of aluminum pedestrian handrail posts as described in E53, "Aluminum Pedestrian Handrail/Bicycle Rail".

#### E52.7.10 Galvanized Steel Dowels and Expansion Sleeves for the Bridge Traffic Barrier Expansion Joint Assembly

- (a) All galvanized steel dowels and expansion sleeves shall be installed as shown on the Drawings.
- (b) A Barrier Expansion Joint Assembly consists of three galvanized plain steel dowels and three galvanized expansion sleeves.
- (c) Each galvanized steel dowel and expansion sleeve shall be held in place securely by a wooden template during concrete placement operations.
- (d) Expansion assemblies shall be installed in a sequential fashion into the concrete barrier panel cast first.

#### E52.7.11 Permeable Formwork Liner

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

- (b) The permeable formwork liner shall be used for only one (1) application.
- (c) The supply, setup, application, and removal of permeable formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E52.7.12 Control Joint Seals

- (a) Formed control joint sealant for all horizontal, vertical, and sloping joints shall be completed in strict accordance with the details shown on the Drawings and in accordance with the Manufacturers recommended methods.

E52.7.13 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CAN/CSA A23.1, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
  - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.
  - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.
  - (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
  - (iv) Unless otherwise noted in Table E52.1, "Requirements for Hardened Concrete", no retarders shall be used.
  - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CAN/CSA A23.1 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.
  - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the City upon request.
- (d) Delivery of Concrete
  - (i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

- (i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:
  - ◆ Limit the amount to be placed at any time (using adequate construction joints);
  - ◆ Augment his facilities and Plant in order to complete the proposed placement;
  - ◆ In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and
  - ◆ The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E52.7.14 Preparation for Concreting Against Hardened Concrete

- (a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:
  - (i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.
  - (ii) All existing concrete surfaces are to be prepared to produce a rough, clean, free of laitance surface meeting the requirements of a CSP 4 concrete surface profile in accordance with the ICRI Guideline No. 310.2R-13. The surface shall be kept clean until concrete placement.
  - (iii) The use of chemicals for hardening of concrete surfaces shall not be permitted, unless authorized in writing by the Contract Administrator. Immediately prior to placing new concrete shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

E52.7.15 Placing Structural Concrete

- (a) General
  - (i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
- (b) Placing Structural Concrete
  - (i) Placement of all structural concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m<sup>2</sup>/h.
  - (ii) The nomograph, Figure D1, Appendix D of CAN/CSA A23.1 shall be used to estimate surface moisture evaporation rates.
  - (iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
  - (iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
  - (v) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
  - (vi) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

- (vii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (viii) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.
- (ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (xi) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.
- (xii) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job site during all placing operations.
- (xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.
- (xiv) Before any concrete is placed for the approach slabs the Bridge deck slab or the sidewalk slab, the Contractor shall demonstrate to the satisfaction of the Contract Administrator before each pour that all necessary adjustments have been made to provide the required camber, crown, slab thickness, and concrete cover. This demonstration may be carried out by means of an attachment securely fastened to the finisher's strike-off machine and moving the machine and the strike-off across the deck over the reinforcing steel with a minimum 3 mm clearance between the steel and attachment.

#### E52.7.16 Finishing of Concrete Surfaces

- (a) Finishing Operations for Unformed Surfaces
  - (i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be removed.
- (b) Type 1 Finish – Exposed Formed Surfaces

- (i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes, but excluding soffit surfaces where an architectural form finish is specified.
  - (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.
  - (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
  - (iv) The surfaces shall be patched as specified in this Specification.
- (c) Type 2 Finish – Unformed Surfaces
- (i) All unformed concrete surfaces, with the exception of the approach slab concrete shall be finished as outlined hereinafter.
  - (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
  - (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
  - (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
  - (v) Exposed concrete surfaces shall be given a transverse broomed finish using a coarse broom to produce regular corrugations to a maximum depth of 2 mm. An edging tool shall be used at all edges. Edges of sidewalk surfaces shall be given a smooth float surface using a magnesium float.
- (d) Type 3 Finish – Approach Slab Concrete
- (i) After final floating, the slab surface shall receive coarse transverse scored texture by drawing a steel tined broom uniformly across the slab surface, to the satisfaction of the Contract Administrator.
- (e) Type 4 Finish - Surfaces Below Finished Grade
- (i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E52.5.20 “Patching Mortar”, E52.5.16 “Bonding Agents”, and E52.7.19 “Patching of Formed Surfaces” of this Specification.
  - (ii) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E52.5.28, “Dampproofing” of this Specification.

#### E52.7.17 General Curing Requirements

- (a) Refer to E52.7.20, “Cold Weather Concreting” for cold weather curing requirements and E16.7.31, “Hot Weather Concreting” of this Specification for hot weather curing requirements.
- (b) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of 24 hours. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.
- (c) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.
- (d) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.
- (e) All concrete shall be cured for a period of seven (7) days. Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following

finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

- (f) Immediately following finishing of the deck and sidewalk slab concrete, apply fog misting until the concrete has enough strength to support the placement of the pre-dampened curing blankets. The misting device shall not be used to apply water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water. Failure to apply wet curing blankets within 40 minutes after the deck slab concrete has been deposited shall be cause for rejecting the Works. Concrete in the rejected area shall be removed and replaced at no additional cost to the City.
- (g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator. Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.
- (h) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.
- (i) The sidewalk slab shall be moist cured in accordance with E52.7.17(e).
- (j) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly and by roller.
- (k) Where curing compound is permitted, and following the completion of finishing operations, the surface shall be sprayed with an initial coating of curing compound, in accordance with the Manufacturer's recommended methods. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.
- (l) Minimum curing periods as required by the Manufacturer shall be met prior to application of waterproofing membrane or damp-proofing. Many suppliers require a minimum curing of twenty-eight (28) days prior to application of the waterproofing membrane and should be considered during the scheduling of the Contractor's work activities.

#### E52.7.18 Form Removal

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.
- (b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.
- (c) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

#### E52.7.19 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.

- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within 24 hours of formwork removal. In the event that patching must be delayed beyond twenty-four (24) hours, surfaces to be patched shall be kept in a saturated surface dry condition until patching takes place.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.
- (f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.
- (g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

#### E52.7.20 Cold Weather Concreting

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

#### E52.7.21 Hot Weather Concreting

##### (a) General

- (i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.
- (ii) Evaporation reducer applied according to the manufacturer's specifications may be used as an alternate to fog misting. MasterKure ER 50 (formerly Confilm) manufactured by BASF is an accepted product.
- (iii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.
- (iv) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.
- (v) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.
- (vi) Sun shades and wind breaks shall be used as required during placing and finishing.

- (vii) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".
- (viii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.
- (ix) Hot weather curing shall follow immediately after the finishing operation.
- (b) Hot-Weather Curing
  - (i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.
  - (ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.
- (c) Job Preparation
  - (i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.
- (d) Concrete Temperature
  - (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E52.3, "Acceptable Concrete Temperatures", for the indicated size of the concrete section.

<b>TABLE E52.3: ACCEPTABLE CONCRETE TEMPERATURES</b>		
<b>THICKNESS OF SECTION, M</b>	<b>TEMPERATURES °C</b>	
	<b>MINIMUM</b>	<b>MAXIMUM</b>
Less than: 1	10	27
1.2	5	25

(ii)

**E52.7.22 Cleanup**

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

**E52.8 Concrete Quality**

**E52.8.1 Inspection**

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.
- (c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

#### E52.8.2 Access

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

#### E52.8.3 Materials

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.
- (c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.
- (d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

#### E52.8.4 Quality Assurance and Quality Control

- (a) The Contract Administrator shall be afforded full access for the inspection and control and assurance testing of concrete and constituent materials, both at the site of Work and at any plant used for the production of concrete, to determine whether the concrete is being supplied in accordance with this Specification.
- (b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.
- (c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.
- (d) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.
- (f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. An outline of the quality tests (required for both Quality Control and Quality Assurance during construction) is indicated below.

#### E52.8.5 Concrete Testing

- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E52.4.2, "Concrete Mix Design Requirements" of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
- (b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in, E52.4.2, "Concrete Mix Design Requirements" of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

- (c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457 for all types of concrete. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
- (d) Rapid chloride permeability testing shall be performed in accordance with ASTM C1202 or CAN/CSA A23.2-23C, with testing performed at 56 days for all types of concrete.
- (e) Testing for post-cracking residual strength index (Ri) of FRC shall be tested as follows. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C1609-10. The average of the peak loads is the cracking load of the concrete (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C1399-07. The average of the peak loads during the reloading is the post cracking load of the concrete (Ppccr). The Ri is equal to the ratio of Ppccr over Pcr. The Contractor shall submit a summary of the results of all post-cracking residual strength index tests, including all load deflection curves. Tests conducted in accordance to ASTM C1399- 07 will be considered invalid by the Contract Administrator if the initial crack in the specimen has occurred after 0.5mm deflection. Specimens shall be sampled in accordance with E52.8.5 (f).
- (f) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method A23.2-1C, "Sampling Plastic Concrete".
- (g) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (h) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (i) Should the Contractor propose to introduce loads to the permanent concrete structure prior to the concrete obtaining its specified design strength (e.g. stripping formwork for cast-in-place suspended slabs (dead load), or permitting traffic on a structure (live load), etc.), the Contractor shall determine the current concrete strength by a strength test and submit his proposed procedure to the Contract Administrator. The Contractor shall only proceed with the written acceptance of the Contract Administrator.

#### E52.8.6 Corrective Action

- (a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

#### E52.9 Measurement and Payment

#### E52.9.1 Structural Concrete

- (a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.
- (b) Items of Work:
  - (i) Bridge Traffic Barriers;
  - (ii) Bridge Sidewalk;
  - (iii) Underbridge Pathway;
  - (iv) Stairway Modifications;
- (c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Place Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

#### E52.9.2 Anchor Units for Stairway Railing Extension

- (a) Supplying and installing anchor units for the stairway railing extension shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Anchor Units for Stairway Railing Extension", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

#### E52.9.3 Galvanized Steel Bridge Traffic Barrier Expansion Joint Assembly

- (a) Supplying and installing galvanized steel Bridge traffic barrier expansion joint assemblies shall be paid for at the Contract Unit Price per unit for "Supply and Install Galvanized Steel Bridge Traffic Barrier Expansion Joint Assembly", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

### **E53. ALUMINUM PEDESTRIAN HANDRAIL/BICYCLE RAIL**

#### E53.1 Description

- (a) This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail/bicycle rail as specified herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.
- (c) This Specifications shall also cover all operations relating to the re-install and salvage any existing Aluminum pedestrian handrail/bicycle rail as specified herein and as shown on the Drawings

#### E53.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;
  - (ii) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;
  - (iii) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

- (iv) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;
- (v) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;
- (vi) CAN/CSA W59.2 – Welded Aluminum Construction; and
- (vii) CAN/CSA S157 – Strength Design in Aluminum.

#### E53.3 Scope of Work

- (a) The Work under this Specification shall involve:
  - (i) Removal and salvage of existing aluminum rail posts;
  - (ii) Removal, storage on-site, and re-installation of the existing aluminum pedestrian handrail panels;
  - (iii) Supplying and installing new aluminum rail posts;
  - (iv) Supplying and installing the aluminum bicycle rail;
  - (v) Supplying and installing miscellaneous steel items and other items associated with the Work.

#### E53.4 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail/bicycle rail. Fabrication shall take place as shown on the Drawings.
- (c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in E23.8, "Quality Control" and mill certificates.
- (d) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
  - (i) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
  - (ii) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.
  - (iii) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding

#### E53.5 Materials

##### E53.5.1 General

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

##### E53.5.2 Material for the Aluminum Pedestrian Handrail/Bicycle Rail

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

E53.5.3 Bituminous Paint

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

E53.5.4 Handrail Anchorage System

- (a) The handrail anchorage system shall consist of the existing handrail anchors.

E53.5.5 Aluminum Shims

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

E53.5.6 Aluminum Filler Alloys for Welded Construction

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

E53.5.7 Hinges

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

E53.6 Equipment

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

E53.7 Construction Methods

E53.7.1 Layout

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

E53.7.2 Fabrication

- (a) General
  - (i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.
  - (ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.
  - (iii) The Fabricator shall fabricate the new components of the aluminum pedestrian handrail/bicycle rail in sections, to permit the installation of the rail sections onto the concrete.
  - (iv) The punching of identification marks on the members will not be allowed.
  - (v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.

- (vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.
  - (vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.
- (b) Sample Panel
- (i) The Contractor shall be required to supply one completely fabricated handrail sample panel, including at least two new posts, one new top bicycle rail, and a refurbished panel, prior to proceeding with the fabrication of the remainder. The sample, once accepted, shall be identifiable for the duration of the Project, but may be incorporated into the rail system. It shall become the standard for acceptance of all aluminum pedestrian handrail panels.
- (c) Cutting
- (i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.
- (d) Welding
- (i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.
  - (ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.
  - (iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:
    - ◆ Guided Bend Test: All bend tests should be fully guided through an angle of 180°. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.
    - ◆ Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.
    - ◆ Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed 3% of the area under inspection.

(e) Bolting

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

E53.7.3 Installation of Aluminum Pedestrian Handrail/Bicycle Rail

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

E53.8 Quality Control

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspecting or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E53.9 Access

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

E53.10 Testing

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

#### E53.11 Measurement and Payment

##### E53.11.1 Aluminum Pedestrian Handrail/Bicycle Rail

- (a) Supplying and Installing the aluminum pedestrian handrail/bicycle rail shall be paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Pedestrian Handrail/Bicycle Rail", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

### **E54. STRUCTURAL REMOVALS**

#### E54.1 Description

- (a) This Specification shall cover all operations relating to the removal and disposal of miscellaneous existing bridge components, as specified herein and as shown on the Drawings. This Specification shall cover structural removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, dismantlement, and disposal of applicable materials.
- (b) The Contractor shall coordinate structural removal operations with the traffic and pedestrian management plan, as there is specific sequencing of work that must take place in order to maintain the required access.
- (c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

#### E54.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) City of Winnipeg By-Law No. 92/2010 Part 7 — Discharges of Wastewater; and

#### E54.3 Scope of Work

- (a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:
  - (i) Partial depth hydro-demolition of the concrete deck at the location of the proposed barrier;
  - (ii) Salvaging the existing aluminum barrier rail along the concrete barrier on the south side of the eastbound Kildonan Settlers Bridge;
  - (iii) Removing and disposing of the existing concrete roadway barrier along the south side of the eastbound Kildonan Settlers Bridge;
  - (iv) Salvaging the existing aluminum pedestrian railing posts along the Kildonan Settlers Bridge;
  - (v) Removing and disposing of the existing underbridge concrete slope paving and chain link fencing to the limits shown on the design drawings;
  - (vi) Removing and disposing of any abandoned electrical, communication, and/or utility conduits not removed by others; and
  - (vii) Complying with all requirements outlined in D15, "Environmental Protection Plan".
- (b) The Work also includes:
  - (i) All structural removal materials not identified for salvage shall revert to the Contractor for off-site disposal.

- (ii) Coordinating structural removals with traffic management.

#### E54.4 Submittals

- (i) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (ii) The Contractor shall prepare and submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a plan detailing the Contractor's runoff control and disposal methods and procedures. Wastewater from the demolition process shall meet the requirements of the City of Winnipeg By-Law No. 92/2010 Part 7, Discharges of Wastewater, prior to entering the City's land drainage sewer system. At no time can runoff of wastewater be permitted to enter the Red River or the City's land drainage system unfiltered. No demolition waste may remain in the Red River.

#### E54.5 Materials

##### E54.5.1 General

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

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

#### E54.6 Equipment

##### E54.6.1 General

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

##### E54.6.2 Hydro-demolition Equipment

- (a) The hydro-demolition equipment shall be a self-propelled machine that utilizes a high pressure water jet stream capable of removing concrete to the depths shown on the plans or as directed by the Contract Administrator and be capable of removing rust and concrete particles from reinforcing steel. Pneumatic hammers (15 kg, 35 pound) class maximum may be used in areas that are inaccessible or inconvenient to the self-propelled machine such as, but not limited to, areas not to exceed 300 mm away from curb, parapets or bridge edges subject to approval of the Contract Administrator

#### E54.7 Construction Methods

##### E54.7.1 General

- (a) The Contractor shall prevent movement, settlement, or damage of existing structures to remain, services, paving, trees, landscaping and adjacent grades. The Contractor shall provide bracing, shoring and underpinning as required and shall have this Work certified by a Professional Engineer registered to practice in the Province of Manitoba employed by the Contractor. If the safety of the structure and/or existing structures or services appears to be endangered during structural removal operations, the Contractor shall cease operations and notify the Contract Administrator immediately.
- (b) The Contractor shall provide flagmen, guards, barricades, railings, and necessary warning lights, and whenever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or other construction, to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial Statutes applicable to the Work. The Contractor shall provide all other protective measures as may be required by any law in force in Manitoba and the Canada Labour Code.

- (c) The Contractor shall be fully responsible for ensuring the public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.
- (d) The Contractor shall not commence any construction operations until such time as all signage and barricades have been installed to the satisfaction of the Contract Administrator.
- (e) Traffic and pedestrian control shall conform to the requirements of E11 "Traffic Management" and E12 "Pedestrian Safety".
- (f) Remove concrete and other removal items with appropriate equipment satisfactory to the Contract Administrator. No demolition products are to find their way into the watercourse or into the steel box girders. The Contractor shall take all necessary precautions to ensure that material do not fall onto any open roadways or sidewalks during removal operations.
- (g) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.
- (h) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures.
- (i) Dispose of all surplus and unsuitable material off-site, in accordance with D15, "Environmental Protection Plan".
- (j) Wherever practical, the Contractor shall recycle disposed materials.
- (k) The Contractor shall submit a list of locations of disposal/recycling for all removed materials to the Contract Administrator.
- (l) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on-site will be allowed without written approval from the Contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

#### E54.7.2 Details of Existing Structure

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

#### E54.7.3 Existing Utilities

- (a) There are existing buried and overhead utilities in the vicinity of the project work. The Contractor shall contact utility providers prior to commencing construction operations to locate utilities.
- (b) The Contractor is responsible for determining the existence, location, and elevation of all utilities and/or structures and is responsible for notifying the appropriate company, department, or person(s) of its intention to carry out its operations.
- (c) The Contractor shall contact all utilities prior to the start of work to arrange for clearances and line locations as construction within the markings provided must be carried out in accordance with the instructions of the affected utilities. The Contractor shall be responsible for the cost of repair to any damage and for any claims due to loss of service caused by construction operations. No compensation will be paid to the Contractor for any delays due to work by utility companies.
- (d) An existing abandoned utility conduit is located within the bridge roadway barrier. The conduit shall be removed along with the concrete barrier.

#### E54.7.4 Partial Depth Deck Hydro-Demolition.

(a) Bridge Deck Preparation Works:

- (i) The final surface preparation of the Bridge deck shall be conducted by hydro-demolition, unless otherwise approved by the Contract Administrator. The resulting surface shall achieve the required grades, while being roughened to the following requirements:
  - ◆ For vertical surfaces, concrete shall be removed by hydro-demolition to a Figure 6.6 - CSP 6 – “medium scarification” profile, in accordance with the ICRI Guideline No. 310.2R-2013 and Table 7.1: Protective Systems, Concrete overlays and repair materials & Table 7.2: Preparation Methods – High- and ultra-highpressure water jetting - CSP6.
  - ◆ For horizontal surfaces, concrete shall be removed by hydro-demolition to a “Scabbling” profile, in accordance with the ICRI Guideline No. 310.2R-2013, Table 7.1 “Concrete overlays and repair materials & Table 7.2 Preparation Methods - CSP8.
- (ii) Prior to the commencement of the removal operation by hydro-demolition, the hydro-demolition equipment shall be calibrated on an area of sound concrete approximately 600 x 1500, as directed by the Contract Administrator. The cost of the calibration procedure is incidental to the Work. The Contractor shall provide the Contract Administrator with the following settings:
  - ◆ Water pressure;
  - ◆ Machine staging control (step);
  - ◆ Nozzle size; and
  - ◆ Nozzle speed.
- (iii) During the calibration, any or all of the above settings may be adjusted in order to achieve removal in accordance with the requirements of the Drawings. When the designated depth of removal is attained, the settings shall be recorded and maintained throughout the removal operation unless otherwise directed by the Contract Administrator. The depth of removal shall be verified periodically and, if necessary, the equipment recalibrated to ensure the depth of removal as indicated on the Drawings is achieved.
- (iv) Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 92/2010 Part 7, Discharges of Wastewater, prior to entering the City’s land drainage sewer system. At no time can runoff of wastewater be permitted to enter the watercourse, or enter the City’s land drainage system unfiltered. The Contractor shall complete daily pH tests, in the presence of the Contract Administrator, of wastewater runoff to ensure that all discharging of wastewater is in compliance with the City’s By-laws. All test reports shall be submitted to the Contract Administrator, and must be within acceptable limits prior to any wastewater entering the City’s land drainage sewer system.
- (v) Bridge deck openings shall be plugged during the hydro-demolition process. The Contractor shall take all necessary precautions to ensure that no sound concrete located below the required depth of removal is damaged or removed. Any damage caused to sound concrete or reinforcing steel beyond the required limit of removal or excessive removal of concrete beyond the required depth of removal by the Contractor during any demolition procedure will be repaired by the Contractor at the Contractor’s own expense to the satisfaction of the Contract Administrator.
- (vi) Where applicable, any “shadowing” of the reinforcing steel by concrete not removed by the process of hydro-demolition shall be removed by the Contractor through other approved means.
- (vii) Upon completion of the partial depth deck hydro-demolition, the Contractor shall remove all cuttings, slurry containing the products of hydro-demolition, and all other debris from the resulting concrete surface so as to produce a thoroughly clean surface. Cleaning of each section shall be done before debris

and water are allowed to dry on the deck surface and prior to the placement of reinforcing steel.

- (viii) All exposed reinforcing steel which is left unsupported by the hydro-demolition process shall be adequately supported and protected from all equipment. All reinforcing steel damaged or dislodged by these operations, as deemed by the Contract Administrator, shall be replaced with new reinforcing of the same size at the expense of the Contractor.

#### E54.7.5 Salvaging Aluminum Barrier Rail and Pedestrian Handrail Posts.

- (a) Remove and salvage the aluminum barrier rails from the existing roadway barrier along the south side of the eastbound Kildonan Settlers Bridge. Rail, post, and splice bar components are the only items considered for salvage. The Contractor shall remove, clean, and neatly stack all salvaged components on the site for inspection by the Contract Administrator. The Contract Administrator will review with the Contractor the items that are deemed suitable for salvaging. The Contractor shall inventory these items only and deliver salvaged components to the City's bridge yard at 960 Thomas Avenue.
- (b) Remove and salvage the aluminum pedestrian handrail posts. The panels will be re-used in the final works and should be stored and protected on site. The orientation of the individual panels should be marked by the contractor prior to removal so that panels may be re-installed in the same orientation. The posts are the only items considered for salvage. The Contractor shall remove, clean, and neatly stack all salvaged components on site for inspection by the Contract Administrator. The Contract Administrator will review with the Contractor the items that are deemed suitable for salvaging. The Contractor shall inventory these items only and deliver salvaged components to the City's bridge yard at 960 Thomas Avenue.

#### E54.7.6 Complying with Environmental Protection Requirements

- (a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Red River from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D15, "Environmental Protection Plan".
- (b) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.
- (c) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.
- (d) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

#### E54.8 Quality Control

##### E54.8.1 Inspection

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

##### E54.8.2 Access

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

#### E54.9 Measurement and Payment

##### E54.9.1 Structural Removals

- (a) Structural removals shall not be measured. This structural removal Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.
- (b) Items of Work:
  - (i) Partial-Depth Deck Removal;
  - (ii) Concrete Barrier Removal;
  - (iii) Underbridge slope paving removals; and
  - (iv) Salvage Items.

#### **E55. REMOVAL OF EXISTING OVERHEAD SIGN STRUCTURE**

##### E55.1 Description

- (a) This Specification covers the removal of the Existing steel Overhead Sign Structure and partial demolition of the existing concrete foundation. The existing sign structure is located in the median near the existing left turn lane from southbound Main Street onto eastbound Chief Peguis Trail.

##### E55.2 Scope of Work

- (a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:
  - (i) Dismantle Existing Overhead Sign Structure from existing foundation and safely lower to ground level.
  - (ii) Detach existing sign panel from horizontal arm shaft.
  - (iii) Dismantle bolted connection near top of vertical shaft to horizontal shaft.
  - (iv) Load and haul existing overhead sign structure components to City of Winnipeg Traffic Services yard.
  - (v) Demolish existing concrete pile to 1 m below final grade.
  - (vi) Backfill the partially demolished pile with suitable roadway base fill material, as shown on the drawings.

##### E55.3 Submittals

- (a) Prior to removal of the Existing Overhead Sign Structure, the Contractor shall prepare and submit a Dismantle Plan to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site. The Dismantle Plan shall include:
  - (i) Traffic Accommodation Plan.
  - (ii) Procedures for Removing, Dismantling and Loading the Existing Overhead Sign Structure.

##### E55.4 Equipment

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

##### E55.5 Construction Methods

#### E55.5.1 General

- (a) The Contractor shall provide flagmen and barricades as necessary at the removal location to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial Statutes applicable to the Work. The Contractor shall provide all other protective measures as may be required by any law in force in Manitoba and the Canada Labour Code.
- (b) The Contractor shall be fully responsible for ensuring the public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.
- (c) The Contractor shall not commence any construction operations until such time that all signage and barricades have been installed to the satisfaction of the Contract Administrator.
- (d) Traffic and pedestrian control shall conform to the requirements of E7 "Traffic Control and Management".
- (e) The Existing Overhead Sign Structure and existing sign are to be salvaged. Haul all salvaged structure components to the City of Winnipeg Bridge Yard at (insert address & Contact) and Sign Panel to the Winnipeg Traffic Services Brace at 421 Osborne Street, Attention: Mr. Jim Donaldson, Phone: 204-232-0301.
- (f) Remove existing foundation concrete with appropriate equipment satisfactory to the Contract Administrator. The Contractor shall take all necessary precautions to ensure that material does not fall onto any open roadways during removal operations.
- (g) Dispose of all surplus and unsuitable material off-site, in accordance with D15, "Environmental Protection Plan". Wherever practical, the Contractor shall recycle disposed materials.
- (h) The Contractor shall promptly haul all removed materials away from the site. No storage of any materials on-site will be allowed without written approval from the Contract Administrator. For all surplus material, it shall be the Contractor's responsibility to find suitable disposal areas away from the site.

#### E55.6 Measurement and Payment

##### E55.6.1 Abandon Cast-In-Place Concrete Foundation for Existing Overhead Sign Structure

- (a) Demolition of the Cast-In-Place Concrete Foundation will not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Abandon Cast-In-Place Concrete Foundation for Existing Overhead Sign Structure" based on the Items of Work described herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for performing all operations herein described and all other items incidental to the Work.
- (b) Backfilling of the existing concrete pile with suitable roadway base course material is considered incidental to "Abandon Cast-In-Place Concrete Foundation for Existing Overhead Sign Structure". No measurement or payment shall be made for this Work unless indicated otherwise.

##### E55.6.2 Removal of Existing Overhead Sign Structure

- (a) Removal of the Existing Overhead Sign Structure will not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Removal of Existing Overhead Sign Structure" based on the Items of Work listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for performing all operations herein described and all other items incidental to the Work.
- (b) Items of Work:
  - (i) Dismantle Existing Overhead Sign Structure.
  - (ii) Demolish Existing Concrete Foundation.

- (iii) Haul salvaged Existing Overhead Sign Structure to the City of Winnipeg Bridge Yard
- (iv) Haul salvaged Existing Overhead Sign Panels to the City of Winnipeg Traffic Services Branch
- (v) Dispose of all surplus and unsuitable material off-site.

## **E56. CAST-IN-PLACE CONCRETE PILE AND PILE CAP FOUNDATIONS FOR NEW OVERHEAD SIGN STRUCTURE**

### **E56.1 Description**

- (a) The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations for new steel overhead sign support structures in accordance with this Specification and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.
- (c) **The requirements of E17 – Structural Concrete, and E16 – Supplying and Placing Reinforcing Steel, shall apply to Cast-in-Place Concrete Pile Foundations for Steel Overhead Sign Support Structures as applicable, except as otherwise supplemented in this section (E21).**

### **E56.2 Referenced Specifications and Drawings**

- (a) The following sections of these specifications:
  - (i) E17 – Structural Concrete.
  - (ii) E16 – Supplying and Placing Reinforcing Steel.
- (b) The following codes and standards:
  - (i) CAN/CSA A23.1 - Concrete materials and methods of concrete construction.
  - (ii) CAN/CSA G30.18 - Carbon steel bars for concrete reinforcement.
  - (iii) ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

### **E56.3 Scope of Work**

- (a) Excavate Shaft for Pile Foundation
- (b) Supply and Install Steel Reinforcing for Pile Foundation
- (c) Supply and Place Structural Concrete for Pile Foundation

### **E56.4 Submittals**

### **E56.5 Materials**

#### **E56.5.1 General**

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

#### **E56.5.2 Cement**

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

#### **E56.5.3 Reinforcing Steel**

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall

be new deformed billet steel bars. All bars, including ties, shall be hot-dip galvanized in accordance with ASTM A767 for a minimum net retention of 610 g/m<sup>2</sup>. Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E56.5.4 Anchor Bolts, Nuts, and Washers

- (a) Anchor bolts, nuts, and washers shall be in accordance with ASTM F1554 (Grade 55), and shall be hot-dip galvanized full length in accordance with ASTM F2329 for a minimum net retention of 610 g/m<sup>2</sup>, for the entire length of the anchor bolts. The threaded portion of the anchor bolts shall be as shown on the drawings. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E56.5.5 Anchor Bolt Templates

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

E56.5.6 Miscellaneous Materials

- (a) Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator, and will be incidental to construction of new concrete pile foundation and no separate payment will be made.

E56.6 Construction Methods

E56.6.1 Location and Alignment of Piles

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

E56.6.2 Buried Utilities

- (a) The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible for verifying and obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.
- (b) The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

E56.6.3 Excavation

- (a) Pile excavation shall be achieved by auguring (i.e. drilling) or hydro-jet excavation for the full depth of all piles.
- (b) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough "slack" in conduits to move them slightly to avoid interference with the pile locations. The Contract Administrator may elect to alter the location of a pile if hydro-jet excavation shows that utilities cannot be avoided.
- (c) If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole excavated as near as possible to the location shown on the Drawings. In locations where underground utilities have been exposed, the underground utilities

shall be covered with clean sand to 300 mm minimum cover around the utility.  
Payment will not be made for condemned piles.

- (d) Upon reaching the required bottom elevation, the bottom of the excavation shall be cleaned using typical methods, to a level deemed acceptable by the Contract Administrator in the field.
- (e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.
- (f) Additional excavation of existing roadway material for the concrete pile cap shall be made as required and is considered incidental to the work.
- (g) All excavated material shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor. Removal of material is considered incidental to the work and no separate payment will be made.

#### E56.6.4 Sleeving

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

#### E56.6.5 Inspection of Excavations

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

#### E56.6.6 Placing Reinforcing Steel

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

#### E56.6.7 Placing Anchor Bolts

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

#### E56.6.8 Forms

- (a) The tops of cast-in-place concrete piles shall be formed with tubular forms (Sonotube) to a minimum depth below final grade as shown on the drawings.
- (b) In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform.
- (c) Forms for pile cap concrete may be steel or plywood and shall conform to the dimensions as shown on the drawings.
- (d) The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.
- (e) A polymer bondbreaker, as acceptable to the Contract Administrator, shall be placed into the form between the pile cap concrete and curb concrete such that they are not in direct contact.

#### E56.6.9 Placing Concrete

- (a) Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts are properly positioned prior to placement of concrete.
- (b) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile and pile cap.
- (c) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be given a hand-roughened finish acceptable to the Contract Administrator. The top of the pile shall be roughened by means of green-cutting or bush hammering as required to provide a suitable construction joint for the pile cap.
- (d) The pile construction joint shall be saturated and covered with an approved bonding agent, as identified in E17, immediately prior to placement of pile cap concrete.
- (e) The top of the pile cap shall be finished smooth with a hand float and provided with a one percent (1%) slope for drainage away from the centreline.

#### E56.6.10 Tremie Concrete for Piles

- (a) If groundwater flow persists into the drilled shaft, the shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete may then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.
- (b) Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the excavation and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry excavation.

#### E56.6.11 Protection of Newly Placed Concrete

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

#### E56.6.12 Curing Concrete

- (a) The top of the freshly finished concrete pile and pile cap shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter.
- (b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

- (c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one hour or 20° in twenty-four hours.

**E56.6.13 Form Removal**

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

**E56.6.14 Patching of Formed Surfaces**

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

**E56.6.15 Cold Weather Concreting**

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

**E56.6.16 Removal and Restoration of Adjacent Surface**

- (a) The existing overlay material shall be removed at least 300 mm beyond the foundation perimeter prior to excavation works. The surface shall be cut around the perimeter in a square section. Concrete slabs damaged beyond the specified limits shall be replaced at the Contractor's cost to the satisfaction of the Contract Administrator. After the pile cap has been constructed, the sides of the median curb shall be constructed flush with the adjacent surface (vertical) as shown on the drawings, transitioning from a sloped face over a length of 1 metre. The top of the median shall be 150 mm below top of pile cap as shown on the drawings.

**E57. SUPPLY AND INSTALLATION OF OVERHEAD SIGN STRUCTURE**

**E57.1 Description**

- (a) The Work covered under this item shall include all operations related to the supply, fabrication, delivery, and erection of the new steel overhead sign support structure.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of the Work as hereinafter specified.

#### E57.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
  - (i) AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.
  - (ii) CAN/CSA G40.20-13/G40.21-13 - General requirements for rolled or welded structural quality steel.
  - (iii) CAN/CSA W59 - Welded steel construction.
  - (iv) CAN/CSA W47.1 - Fusion Welding of Steel Company Certification.
  - (v) CAN/CSA W48 - Electrode and Filler Metals Certification.
  - (vi) ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - (vii) ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
  - (viii) ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - (ix) ASTM F3125 - Standard Specification for High Strength Structural Bolts.
  - (x) ASTM F1554 - Standard Specification for Anchor Bolts.
  - (xi) ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
  - (xii) ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
  - (xiii) ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

#### E57.3 Scope of Work

- (a) The Work under this Specification shall include the following items, as shown on the Drawings or as otherwise directed by the Contract Administrator:
  - (i) Fabrication of new Overhead Sign Structure;
  - (ii) Hot Dip Galvanizing;
  - (iii) Supply of all Sign mounting hardware;
  - (iv) Pick-up of new Sign Panel;
  - (v) Erection of new Overhead Sign Structure and Sign Panel.

#### E57.4 Submittals

- (a) Proposed welding procedure conforming to CAN/CSA W59 and CAN/CSA W47.1 to be used in fabricating the various components. The following shall be included in the submitted welding procedure:
  - (i) The welding process, position of weld, filler metal, flux, shielding gas if required, joint configurations, number and size of passes, preheat and inter-pass temperatures if required, sequence of passes, current, rate of pass, electrode size, electrical stick-out and polarity;
  - (ii) Methods proposed for edge preparation;
  - (iii) Measures proposed to control distortion, shrinkage and residual stresses;
  - (iv) Proposed methods and sequence of assembly; and
  - (v) Welding equipment to be used.

- (b) Mill certificates and mill test reports showing chemical analysis and physical tests of all supplied material shall be submitted to the Contract Administrator for review prior to commencement of fabrication.
  - (i) Where mill test certificates originate from a mill outside Canada or the United States of America, the Contractor shall have the information on the mill test certificate verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.
- (c) Proof shall be submitted to the Contract Administrator demonstrating that the bolts, nuts, and washers meet the chemical composition, mechanical properties, dimensions, workmanship, and head burst as required by ASTM F3125. Verification of the acceptability of assemblage of zinc coated bolts shall be provided with the bolts, nuts and washers delivered to the job site shall also be submitted to the Contract Administrator.
- (d) A complete set of Shop Drawings for approval prior to commencement of fabrication.
- (e) Erection procedure, including loading and transportation procedures for overhead and cantilevered sign structures, equipment type and location, proposed route and all traffic control procedures shall be stamped, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba.

## E57.5 Materials

### E57.5.1 General

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

### E57.5.2 Handling and Storage of Materials

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

### E57.5.3 Structural Steel

- (a) Structural steel for all components of the overhead sign support structures shall be in accordance with CSA Standard G40.21 M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to three hundredths of a percent (0 to 0.03%) or fifteen hundredths to twenty-two hundredths of a percent (0.15 to 0.22%) for monotubular shafts and arms, and to less than three tenths of a percent (0.3%) for all other steel components.
- (b) The Contractor is advised that copies of mill test certificates showing the chemical and physical properties of all structural steel to be supplied under this Specification must be supplied to the Contract Administrator and be found acceptable prior to commencement of fabrication.
- (c) Steel shall not be acceptable unless the mill test certificate states the grade to be as indicated on the Drawings. Lower grade steel shall not be acceptable (despite favourable published mill test results). Items fabricated without steel certification shall be rejected.

### E57.5.4 Flange Bolts, Nuts, and Washers

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

E57.5.5 Mounting Bracket Fasteners (Bracket-to-Bracket)

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

E57.5.6 Mounting Bracket Fasteners (Bracket to Panel)

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

E57.5.7 Fasteners for Handhole Covers

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

E57.5.8 Hot-Dip Galvanizing

- (a) Hot-dip galvanizing of structural steel shall be in accordance with ASTM A123 for a minimum net retention of 610 g/m<sup>2</sup>.

E57.5.9 Galvanizing Touch-up and Field-Applied Galvanizing

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

E57.5.10 Cold Applied Galvanizing Compound

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

E57.5.11 Aluminum T-Bars

- (a) The Contractor shall supply and deliver aluminum T-bars to the City of Winnipeg Traffic Services Branch Sign Shop located at:  
City of Winnipeg Sign Shop  
1220 Pacific Avenue  
Winnipeg MB R3E 1G6  
Work: 204-986-5844

- (b) The aluminum T-Bars shall be delivered a minimum of three (3) weeks in advance of the Contractor's intended date for pick-up. The City will install the sign plates/panels on the supplied T-bars.
- (c) Aluminum T-Bars shall be in accordance with ASTM B221 6061-T6.
- (d) The Contractor shall deliver Aluminum T-Bars

#### E57.5.12 Sign Plates/Panels

- (a) Sign plates/panels will be supplied by the City of Winnipeg Traffic Services Branch. The Contractor will be responsible for pick-up of all sign plates and panels at the City of Winnipeg Traffic Services Branch Sign Shop and will be responsible for installation of all sign plates and panels on the sign support structures.

#### E57.5.13 Welding Consumables

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

#### E57.5.14 Miscellaneous Materials

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

#### E57.6 Equipment

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

#### E57.7 Construction Methods

##### E57.7.1 General

- (a) Holes in the base plates shall be sized as shown on the Drawings, and provisions made for field erection must be accurate within plus or minus 13 mm between supports, without affecting final installation and load capacity.
- (b) The base plates for the sign support structures shall be constructed to be fully compatible and mountable on the anchor bolts, provided in the foundations by the Contractor.
- (c) Sufficient reinforced handholes and wiring holes shall be provided for lighting of the signs as shown on the Drawings. All wiring holes shall have threaded couplings. All unused coupling holes shall be capped with a threaded galvanized plug.

- (d) The sign support structure shall be so fabricated that erection can be achieved by means of bolted connections.
- (e) Each sign structure shall be provided with a "raised" structure identification number with a welding electrode in accordance with the details shown on the Drawings. The sign structure identification number shall be placed before hot-dip galvanizing.
- (f) Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facilities shall be consulted regarding the size and location of these holes.
- (g) Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing the sign structures.

#### E57.7.2 Fabrication

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

#### E57.7.3 Welding

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

#### E57.7.4 Surface Preparation and Cleaning

- (a) Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A123 and SSPC Specification SP:6, "Commercial Blast Cleaning," unless otherwise specified herein. The Contractor shall ensure that all exterior and interior surfaces of vertical support members of sign structures are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 610 g/m<sup>2</sup>. All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.
- (b) The sandblasting and cleaning of sign structures shall be done in the shop.

- (c) After the structures have been sandblasted they shall be thoroughly cleaned of all sandblasting abrasive grit and debris, with special attention paid to areas of the structure where sand and debris collect, including but not limited to, behind the gusset plates, handholes and base plate.
- (d) After the sign structures have been sandblasted and cleaned, the Contract Administrator shall be notified to carry out a visual inspection of the structures in the shop before they are shipped to the galvanizing plant. A minimum of two (2) business days' notice shall be provided.

#### E57.7.5 Hot-Dip Galvanizing

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

#### E57.7.6 Delivery and Erection

- (a) The Contractor shall notify the Contract Administrator at least two (2) Working Days in advance of the anticipated delivery to the Site and erection of the overhead sign support structure.
- (b) The sign structure shall be lifted and secured with nylon ropes or other approved methods. Use of steel chains and steel hooks against hot-dip galvanized or powder coated surfaces will not be permitted. The structure components (shaft and arm, etc.) shall be placed on timber blocking and secured with nylon ropes during their transportation to the Site.
- (c) Refer to E11 for Traffic Management requirements during erection.

#### E57.7.7 Attachment of Structure to Anchor Bolts

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

**E57.7.8 Structural Bolt Installation**

- (a) Structural bolts for flange and splice connections shall be tightened in accordance with the turn-of-nut method as follows:
  - (i) alternately tighten all bolts to achieve a snug tight condition. The mating surfaces shall be in firm contact;
  - (ii) tighten all bolts in accordance with Table E57-1;and,
  - (iii) following tightening, check all bolts in the joint by hand using an ordinary wrench.

**(iv) Table E57-1: Required Turns Past Snug Tight for Turn-of-Nut Method**

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

**E57.7.9 Installation of Sign Plates/Panels**

- (a) The Contractor will be responsible for installation of sign plates/panels on the sign support structures, unless otherwise noted on the Drawings.
- (b) The Contractor shall take great care when handling existing or new plates. Any damage to sign plates will be repaired by the City of Winnipeg Traffic Services. All costs and delays associated with the repair shall be borne by the Contractor.
- (c) The Contractor shall install the sign plates/panels on the sign support structures immediately following erection of the support structures (same day). In no case will a sign support structure be allowed to be erected and left for a significant amount of time (greater than one (1) day) without having the sign plates/panels installed.

- (d) Sign panels shall be installed such that the panels are level to ground after all support structure deflection has occurred.
- (e) Sign panels shall not be twisted or warped following installation.

#### E57.7.10 Field-Applied Touch-up Galvanizing

- (a) Any areas of damaged galvanizing on the sign structures shall receive field-applied touch-up galvanizing.
- (b) Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose, scale, rust, paint, grease, dirt, or other contaminants.
- (c) For self-fluxing, low temperature, zinc based alloy rods, preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.
- (d) For cold applied galvanizing compound, the approved product shall be applied by either a brush or roller. The compound shall be applied in three (3) coats, with each coat having a dry film thickness of 60 µm (2.36 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.

#### E57.8 Quality Control

##### E57.8.1 General

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

##### E57.8.2 Welding Qualifications

- (a) The Contractor shall produce evidence that the plant has recently been fully approved by the C.W.B. to the requirements of CSA W47.1 Division 2.1 for welding of steel structures.
- (b) Approved welding procedures shall be submitted to the Contract Administrator prior to fabrication of any steel items.

##### E57.8.3 Inspection

- (a) In addition to the Contractor's own quality control testing of all materials, welding procedures and steel fabrication including hot-dip galvanizing may be inspected and tested by the Contract Administrator to ascertain compliance with the Specifications and Drawings.
- (b) The Contract Administrator may hire a testing agency certified by the Canadian Welding Bureau to carry out shop fabrication inspection and testing before the overhead sign support structure is approved ready for installation of coating system. The inspector shall have access to all of the fabricator's normal quality control records for this Contract, specified herein. Inspection and testing will include:
  - (i) visual inspection of one hundred percent (100%) of welds;

- (ii) ultrasonic testing of one hundred percent (100%) of full penetration sections of longitudinal seam welds and circumferential butt welds;
  - (iii) magnetic particle testing of a random ten percent (10%) of partial penetration sections of longitudinal seam welds;
  - (iv) ultrasonic testing of twenty-five percent (25%) of base plate and flange plate welds; and,
  - (v) inspection of hot-dip galvanizing and coating thickness.
- (c) Welds that are found by any of the inspection and testing methods to be inadequate and unsatisfactory shall be repaired in accordance with CSA W59 and then retested. The cost of the repairs and the cost of the retest shall be paid for by the Contractor.
- (d) No repair shall be made until agreed to by the Contract Administrator.
- (e) Defects in hot-dip galvanizing shall be rectified as directed by the Contract Administrator.

**E57.8.4 Access**

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

**E57.9 Measurement and Payment**

- (a) Supply and installation of the new steel overhead sign support structure will not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Supply and Installation of 6.45 m Cantilever Sign Structure", based on the Items of Work listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for performing all operations herein described and all other items incidental to the Work.
- (b) Items of Work:
- (i) Fabrication of New Steel Overhead Sign Support structure.
  - (ii) Galvanizing of New Steel Overhead Sign Support structure.
  - (iii) Delivery of New Steel Overhead Sign Support structure.
  - (iv) Erection of New Steel Overhead Sign Support structure.
  - (v) Installation of New Overhead Sign Panel.

**E58. SUPPLY AND INSTALL ZINC ANODES IN DECK CONCRETE**

**E58.1 Description**

- (a) This Specification shall cover all operations relating to the repair of designated deck concrete on the Kildonan Settlers Bridge as herein specified.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

**E58.2 Referenced Specifications and Drawings**

- (a) See design drawings B216-18-06 Sheet #6 for locations

**E58.3 Materials**

**E58.3.1 General**

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

**E58.3.2 Testing and Approval**

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

**E58.3.3 Galvanic Anodes**

- (a) Galvanic Anodes shall be Galvashield XPT – Anode Type 1A Class P.

**E58.4 Equipment**

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

**E58.5 Construction Methods**

- (a) Remove all unsound concrete from the deck in the area of the hydro-demolition by saw cutting.
- (b) Install galvanic anodes as per the manufacturer's recommendations and as shown.
- (c) Clean existing concrete surfaces that will be in contact with the repair concrete. Cleaning is considered incidental and will not be paid for separately. Placement of repair concrete is considered part of the pay item "Supply and Place Structural Concrete – Bridge Traffic Barriers".
- (d) Apply bonding grout or epoxy bonding agent to all existing concrete surfaces that will be in contact with repair concrete.
- (e) Place concrete using forms as required and cure in accordance with section E52 of these specifications.

**E58.6 Measurement and Payment**

**E58.6.1 Zinc Anodes in Deck Concrete**

- (a) Supply and installation of zinc anodes will be measured on a unit basis and paid for at the Contract Unit Price per "each" for "Supply and Install Zinc Anode Units", installed in accordance with this Specification and accepted by the Contract Administrator.
- (b) Saw cutting and other work associated with zinc anode installation is considered incidental to the work for "Supply and Install Zinc Anode Units" and will not be paid for separately.

**E59. DECK DRAIN MODIFICATIONS**

**E59.1 Description**

- (a) The Work covered under this item shall include all operations related to the supply, fabrication, delivery, and installation of the new deck drains, as well as decommissioning of the existing deck drains.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.
- (c) The Contractor shall notify the Contract Administrator of any subcontractors (Fabricators) that have been subcontracted by the Contractor to fabricate, load and transport the steel components. The Contractor shall remain responsible for the work of such subcontractors. All requirements, such as right to access, shall apply to such subcontractors.

## E59.2 Referenced Specifications and Drawings

- (a) The latest editions of the following codes and standards:
  - (i) CSA G40.20/G40.21 – Structural Quality Steels
  - (ii) CSA W59 – Welded Steel Construction
  - (iii) ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - (iv) CSA W48 – Electrode and Filler Metals Certification

## E59.3 Scope of Work

- (a) The scope of work is anticipated to consist of the following:
  - (i) Supply, Fabrication and Delivery of new galvanized steel deck drain pipes and deck drain grates.
  - (ii) Installation of new galvanized steel deck drain pipes and deck drain grates, tying into the existing downspouts from inside of the steel box girders.
  - (iii) Infilling existing deck drains with concrete to underside of existing deck.

## E59.4 Submittals

- (a) The Contractor shall submit the following documents to the Contract Administrator:
  - (i) Copies of Mill Test Certificates in accordance with CSA G40.20/G40.21-13 (ASTM A6), showing chemical analysis and physical tests of all structural steel prior to commencement of fabrication. Structural steel without certification will be rejected.
  - (ii) Certification of chemical analysis and physical tests for all materials;
  - (iii) A complete set of Shop Drawings prior to commencement of fabrication.
  - (iv) Welding Procedure Specification (WPS), including weld sizes, position of welding, preheating, types of electrodes, flux, current, and sequence of welding in addition to stress-relief heat treatment shall be submitted for the Contract Administrator's review. Any standard sheets submitted for review shall be marked up to indicate clearly the type of weld to be used for every particular application.

## E59.5 Materials

### E59.5.1 General

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.
- (b) The types and grades of steel used shall be as shown on the Drawings.
- (c) Materials called for under these Specifications and on the Drawings shall, unless otherwise specified, satisfy the testing procedures and be in strict accordance with the requirements set out in the latest edition of the standards identified.

### E59.5.2 Deck Drain Downspout Steel

- (a) Steel shall conform to the requirements of CSA G40.21-13.
- (b) The grades of steel HSS sections shall be CSA G40.21-13 300W, or equivalent.
- (c) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate. The mill test certificate shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.

### E59.5.3 Deck Drain Grate Steel

- (a) Steel shall conform to the requirements of CSA G40.21-13.
- (b) The grades of steel HSS sections shall be CSA G40.21-13 300W, or equivalent.
- (c) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate. The mill test certificate shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.

### E59.5.4 Infill Concrete

- (a) Infill Concrete shall conform to the requirements of section E52 of these specification.
- (b) Infill Concrete shall be of Type 2 as indicated in section E52 of these specifications.
- (c) Supplying and Placing Infill Concrete is considered incidental to the Deck Drain Modifications work and will not be paid for separately.

### E59.5.5 Welding

- (a) Welding electrodes and fluxes shall conform to the latest revised editions of:
  - (i) CSA W48 / AWS D1.5/D1.5M for submerged arc welding;
  - (ii) CSA W48 / AWS D1.5D1.5M for manual welding; and,
  - (iii) AWS A5.29 / A5.29M for flux cored arc welding.
- (b) The deposited weld metal shall have atmospheric corrosion properties and Charpy V-Notch impact resistance properties similar to the parent metal being welded.
- (c) The electrodes for manual welding shall be low-hydrogen Type E55018-C3 (E8018-C3).
- (d) The electrode for flux core welding shall be Low Hydrogen E8XTX-Ni1 (E7XT8-Ni1).
- (e) All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.

### E59.5.6 Hot Dip Galvanizing

- (a) Hot Dip galvanizing of deck drain elements identified on the Drawings as being hot-dip galvanized shall be executed after fabrication of the element and shall be in accordance with ASTM A123 and shall have a minimum mass of zinc coating of 610 g/m<sup>2</sup>.

### E59.6 Equipment

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

### E59.7 Construction Methods

#### E59.7.1 General

- (a) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the members' resistance to brittle fracture.
- (b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

- (c) If damage occurs to the steel during fabrication, the Contract Administrator shall be notified immediately. The Contractor shall submit remedial method statement. Remedial repair measures are subject to the approval of the Contract Administrator.
- (d) The Contractor shall verify all existing geometry as well as proposed dimensions for deck drain downspouts in the field prior to fabrication and construction.
- (e) Dimensions and fabrication that control field matching of parts to existing downspouts shall receive careful attention in order to avoid field adjustments.
- (f) Any cutting of downspout steel shall be in accordance with AWS D1.1 and CSA W59.
- (g) Welded splice joints shall be assembled with butting members adjusted for line before the fit-up preparations are made for welding.

#### E59.7.2 Cleaning Material

- (a) The steel shall be clean, free from rust, mill scale, and other foreign matter before being worked in the shop. Material shall be cleaned by sandblasting or other methods subject to the Contract Administrator's approval.

#### E59.7.3 Finish

- (a) All portions of the Work shall be neatly finished. Shearing, cutting, chipping and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

#### E59.7.4 Welding

- (a) Welding shall conform to the requirements of the Structural Welding Code - Steel of the American Welding Society AWS D1.5 and addendum and CSA W59 Welded Steel Construction.
- (b) Welding Operator Qualification
  - (i) Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. Qualification shall have been issued within 2 years of commencement of fabrication.
- (c) Welding Procedures, Specifications and Qualification
  - (i) Welding procedures that conform in all respects to the approved procedures of AWS D1.1 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications.
- (d) Welding Materials
  - (i) All electrodes for manual shielded metal arc welding shall conform to the low-hydrogen classification requirements of the latest edition of the American Welding Society's Filler Metal Specification AWS A5.1 or AWS A5.5 and the CAN/CSA W48 Specification and be capable of producing weld metal having an impact strength of at least 27 J (Charpy V-Notch) at -18°C. All bare electrodes and flux used in combination for submerged arc welding, the electrode and gas shielding used in combination for gas metal-arc welding, or the electrode and shielding medium used in combination for flux cored arc welding of steels shall conform to the requirements in the latest edition of the American Welding Society AWS A5.17, A5.18 or A5.20 and CAN/CSA W48 and be capable of producing weld metal having a minimum impact strength of 27 J (Charpy V Notch) at -18°C or shall be capable of producing low alloy weld metal having the mechanical properties listed in Table 4.1.1 of AWS D1.1.
- (e) Field Welding
  - (i) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings, AWS D1.1 and CSA W59.

#### E59.7.5 Handling, Delivery and Storage of Materials

- (a) Precautionary measures shall be taken to avoid damage to the galvanized steel deck drain elements during handling, transit, stockpiling and erecting. Special attention is

directed to the shipping and storing. Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

- (b) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the miscellaneous metal. The materials shall be kept separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

#### E59.7.6 Installation

- (a) Before installation of miscellaneous metal, the Contractor shall satisfy himself that the installation locations are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.
- (b) All necessary precautions shall be taken for field weld work performed inside the confined space of the existing steel box girders. The Contractor shall prepare a Safe Work Plan complete with Confined Space work requirements and testing procedures prior to performing any work inside the steel box girders.

#### E59.7.7 Workmanship

- (a) The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.
- (b) Hammering which will injure or distort the member is not permitted.

#### E59.7.8 Misfits and Field Fitting

- (a) Misfits of any part or parts of deck drains being installed under this Specification may be cause for rejection. No field fitting shall be undertaken by the Contractor until the cause for misfit of parts has been determined and the Contract Administrator, so informed, has given direct approval to accept the Contractor's proposed corrective measures. The Contract Administrator's decision as to the quantity of such work to be performed at the Contractor's expense will be final and binding.

#### E59.8 Quality Control

##### E59.8.1 Quality Control / Quality Assurance

- (a) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Work. All deck drain steel shall be free of surface imperfections, laminations and other defects.
- (b) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.
- (c) All welding may be subject to inspection by Non-Destructive Testing. This inspection shall be carried out in a manner approved of the Contract Administrator.
- (d) All materials may be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (e) All defects revealed shall be repaired by the Contractor at their own expense and to the approval of the Contract Administrator.

#### E59.9 Measurement and Payment

##### E59.9.1 Deck Drain Modifications

- (a) Supply, Fabrication, Delivery and Installation of Deck Drain Downspouts and Deck Drain Grates for the Deck Drain Modifications will be measured on a unit basis and paid for at the Contract Unit Price for "Deck Drain Modifications", which price shall be payment in full for supplying all materials and completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.

E59.9.2 Infill Concrete for Existing Deck Drains

- (a) Supplying and Placing Infill Concrete for decommissioning the existing deck drains shall be considered incidental to "Deck Drain Modifications", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

**E60. EXPANSION JOINT MODIFICATIONS**

E60.1 Description

- (a) This Specification shall cover the supply and installation of components associated with the expansion joint modifications works including cover plates, traffic barrier mounting units, anchors, adhesives, grout and pre-formed neoprene joint seals as shown on the Drawings and as specified herein.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E60.2 Referenced Specifications and Drawings

E60.3 Scope of Work

- (a) Removal of hardware from existing sidewalk expansion joint locations.
- (b) Installation of hardware at sidewalk expansion joint locations.

E60.4 Submittals

E60.5 Materials

E60.5.1 General

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

E60.5.2 Epoxy Adhesive

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

E60.5.3 Epoxy Adhesive Strip

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

E60.5.4 Epoxy Grout

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

E60.5.5 Grout

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

E60.5.6 Expansion Joints

- (a) Expansion joints shall be modular expansion joint located at the abutments SU1 and SU6, as shown on the Design Drawings.
- (b) The modular expansion joints shall be a Wabo Modular Joint System, as specified in the Drawings, and supplied by D.S. Brown, Goodco, or Watson Bowman Acme Corp., or equal as accepted by the Contract Administrator in accordance with B7.
- (c) Modular expansion joints shall have fabricated cover plates and slider plates as shown on the Drawings.
- (d) The seals at each joint shall be made out of neoprene, as accepted by the Contract Administrator and shall be supplied in one continuous piece, separate from the steel extrusions or joint. No shop or field splicing will be allowed in the seals.
- (e) All fasteners and hardware of the modular bridge deck expansion joints shall be galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 gm/m<sup>2</sup>.

E60.5.7 Steel

- (a) Steel supplied for the fabrication of the bridge deck expansion joints shall conform to CSA Standard CAN/CSA-G40.21-04, Grade 300W, or equal as accepted by the Contract Administrator in accordance with B7. They shall be galvanized after shop fabrication in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 gm/m<sup>2</sup>.

E60.5.8 Steel Extrusions

- (a) Steel for the extrusions shall conform to CSA Standard CAN/CSA-G40.21-04, Grade 230G minimum.

E60.5.9 Anchor Studs

- (a) Anchor studs shall conform to the requirements of ASTM Specification A108-07, Grade Designation 1020 and shall be galvanized.

E60.5.10 Miscellaneous Steel Items

- (a) (a) Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to CSA Standard CAN/CSA-G40.21-04, Grade 300W and shall be galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 gm/m<sup>2</sup>.

E60.5.11 Galvalloy

- (a) Galvalloy shall be as supplied by Metalloy Products Company, P.O. Box #3093, Terminal Annex, Los Angeles, California. Locally, this is available from Welders Supplies Ltd., 25 McPhillips Street.

E60.5.12 Welding

- (a) Welding shall be of a low oxygen classification. Manual electrodes shall be E7016 or E7018. All welding shall be in accordance with CSA Standard W59-03.

E60.5.13 Preformed Neoprene Joint Seals

- (a) General
  - (i) Preformed joint seal shall be manufactured from a vulcanized elastomeric compound using crystallization resistant polychloroprene (neoprene) as the only polymer.

- (ii) The preformed neoprene joint seal shall meet the requirements of Ontario Provincial Standard Specification (OPSS) 1210 "Material Specification for Preformed Neoprene Joint Seals", latest edition, and as amended herein; and of Table 68 - 1 of this Specification. All tests will be made on specimens prepared from the extruded seals.

#### E60.6 Equipment

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

#### E60.7 Construction Methods

##### E60.7.1 Fabrication

- (a) The Contractor shall submit to the Contract Administrator detailed Shop Drawings for the bridge deck expansion joints that are stamped, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba in accordance with E9. No fabrication shall commence until acceptance of the Shop Drawings from the Contract Administrator has been obtained. The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall be responsible for the joint installation procedure.
- (b) Care shall be taken to ensure that all members are straight and flat and free from twists, bends, and distortions due to welding. The units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall and skew, as well as accurate positioning and alignment of supporting brackets. The Contractor shall exercise care in the handling of all units to prevent twists, bends, and warping.
- (c) Matching expansion joints shall be assembled and bolted together for shipping.
- (d) Expansion joint assemblies shall be shop checked for fit and match marked.
- (e) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint, and other foreign material by commercial sand, grit or shop blasting, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.
- (f) In no case shall weldments be substituted for extrusion shapes.

##### E60.7.2 Installation

- (a) The Contractor shall install expansion joints as shown on the Drawings and shall be responsible for the correct matching and seating of parts. The expansion joints shall be checked for accurate matching of sliding plates with the bridge deck expansion joints installed at the specified skews and crossfalls.

##### E60.7.3 Galvanizing Touch-up Prior to Placement of Concrete

- (a) Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.
- (b) Surfaces to receive field applied galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.
- (c) The process is to be repeated as required to achieve a thickness comparable to original galvanizing.

##### E60.7.4 Placement of Concrete at Expansion Joints

- (a) The assemblies shall be set in position such that they will remain true to line and elevation during and after concreting.
- (b) Care shall be taken during compaction of the concrete to ensure that there are no voids in the concrete under and around the structural steel components.
- (c) Before concreting, the expansion joint opening shall be set to give the correct width for the mean concrete temperature of the deck. The width shall be obtained from the installation temperature table given on the accepted Shop Drawings.
- (d) Immediately prior to placement of concrete at the expansion joints, all metal contact surfaces between the expansion joint and concrete shall be coated with epoxy adhesive.
- (e) Epoxy grout shall be used to fill any bolt holes left after the removal of manufacturer's clamping channels.

#### E60.7.5 Installation of Seal

- (a) The seal at each expansion joint unit shall be installed as one continuous piece after completion of all concreting operations, to the satisfaction of the Contract Administrator, and shall not be installed prior to casting of the expansion joints into the concrete.

#### E60.7.6 Watertight Verification of Joint Seal

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

#### E60.8 Guarantee

##### E60.8.1 Fabrication Warranty

- (a) Before final acceptance of the expansion joints by the Contract Administrator, the Contractor shall provide the Department with a written warranty from the expansion joint supplier stating that they will perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of Completion, provided that the expansion joints have been properly installed, acceptable to the Contract Administrator. The Supplier shall state that they have observed the installation and found it to be in accordance with their recommended procedure. The Supplier shall warranty the replacement of the joints, including removal of the defective expansion joint assemblies and supply and installation of the replacement expansion joint, at no cost to the City of Winnipeg, in the event that the joint does not perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of Completion.

##### E60.8.2 Installation Warranty

- (a) The Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication warranty.
- (b) Similar to the expansion joint Supplier, and prior to final acceptance by the Contract Administrator, the Contractor shall warranty, in writing, the performance of the expansion joints for a period of five (5) years from the date of Total Performance. The Contractor shall provide in the warranty for the replacement of the expansion joints at no cost to the City of Winnipeg, including all direct and indirect costs in the event the expansion joints do not perform satisfactorily in the range of design movement and

under the design loads for a period of five (5) years from the date of Total Performance.

E60.9 Quality Control

E60.9.1 General

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to the close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E60.9.2 Markings

- (a) All joint seals shall be identified as to the manufacturer by means of a continuous permanent mould mark. The mould marks shall be registered with the Contract Administrator and shall be used on all seals produced by the respective manufacturer. The seal shall also be permanently marked, on the side of the seal, with the date of production and the batch/lot, at intervals of not more than 1.2 m.
- (b) The Contractor shall supply to the Contract Administrator a summary of the seals identifying the data of manufacture, the batch/lot, and the proposed installation location.

E60.9.3 Samples and Testing Procedures

- (a) The Contractor shall supply sample material at no charge to the City for quality control testing purposes. The samples will each be 1.5 m long. Each sample will represent not more than three expansion joint seals of the same size, lot, and make and shall be continuous with same until sampled by the Contract Administrator. As soon as the seals to be used in the joint assemblies have been manufactured, they shall be available to the Contract Administrator for sampling.
- (b) Testing procedures will be in accordance with the latest revisions of the methods indicated on Table E60-1.
- (c) All materials failing to meet the Specification requirements will be rejected.
- (d) Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

**Table E60-1: Physical Requirements**

**Table 68 – 1: Physical Requirements**

<b>PROPERTY</b>	<b>PHYSICAL REQUIREMENTS</b>	<b>TEST PROCEDURE*</b>
1.Tensile Strength	Minimum 13.5 MPa	ASTM D412 OPSS 1210.07.03.01.02
2.Elongation at Break	Minimum 250%	ASTM D412 OPSS 1210.07.03.01.02
3.Hardness, Type A Durometer	55, +7, -5	ASTM D2240 OPSS 120.07.03.01.03
4. Oven Aging Test 70 Hour at 100°C Reduction in Tensile Strength Reduction in Elongation Increase in Hardness	Maximum 20% Maximum 20% Maximum 10 Points	ASTM D573
5. Permanent Set at Break	Maximum 10%	ASTM D412

6. Low Temperature Stiffening Hardness, Type A Durometer	Maximum 15 Points	ASTM D2240 OPSS 1210.07.03.01.03
7. Oil Swell, ASTM Oil No. 3	No Cracks	ASTM D1149
70 h at 40°C (wipe with toluene to remove surface contamination)		
9.**Safe Compressibility Test (Z min.)	Min. 50% Min. 55%	OPSS 1210.07.03.01.04
Bridge Seal - □ 63.5 mm > 63.5 mm		
10.**Pressure Generation at 15% Deflection	Min. 20 kPa	OPSS 1210.07.03.01.04
11.**Recovery	Min. 80% No Cracking	OPSS 1210.07.03.01.05
22 h at -28°C	Min. 88% Splitting or	
70 h at -10°C	Min. 85% Sticking	
70 h at +100°C		

#### E60.10 Measurement and Payment

- (a) Modifications of Expansion Joints will be measured on a per unit basis and will be paid for at the Contract unit price for each "Modifications to Expansion Joints", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

### E61. STRUCTURAL BACKFILL

#### E61.1 Description

- (a) This Specification shall cover all operations related to backfill work as herein specified and in the latest version of the City of Winnipeg Standard Construction Specifications CW 2030, CW 3110, CW 3130, CW 3170 and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

#### E61.2 References

- (a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
- (i) CW 2030 – Excavation Bedding and Backfill
  - (ii) CW 3110 – Subgrade, Sub-Base, and Base Course Construction
  - (iii) CW 3130 – Supply and Installation of Geotextile Fabrics
  - (iv) CW 3170 – Earthwork and Grading.

#### E61.3 Scope of Work

- (a) The Work under this Specification shall involve:
- (i) Supply and placing granular base course under the pathway located underneath the east and east abutments;
  - (ii) For backfill placement in freezing conditions, heating of subgrade and backfill prior to placement, and maintaining those materials in an unfrozen state.

#### E61.4 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material, including evidence that the specified gradation has been met for granular material and Standard Proctor Density (SPD) and Optimum Moisture Content (OMC) for cohesive (common fill) materials to establish a baseline for field compaction of materials.

#### E61.5 Equipment

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

#### E61.6 Materials

- (a) Backfill Material
  - (i) 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.
  - (ii) All materials shall be approved by the Contract Administrator at least fourteen (14) Days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, at the time of supply to site and placement, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.
  - (iii) Backfill materials shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Backfill shall not be placed on frozen subsoil. Heating of the backfill materials and/or subgrade shall be undertaken as required, to maintain the temperature of the material above freezing.
  - (iv) All granular backfill, including granular base course and drainage fill shall be clean and free from organic material, meeting the gradation requirements of Table CW 2030.1 in Specification CW 2030 and Table 2160.1 in Specification CW 2160.
- (b) Geotextile Fabric
  - (i) Geotextile fabric placed along the limits or within structural backfill shall be "Separation Geotextile Fabric" supplied in accordance with CW 3130.
  - (ii) Supply of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.
- (c) Perforated Drain and Geotextile Filter Sock
  - (i) The drainage fill shall contain HDPE perforated drains complete with filter socks.

#### E61.7 Construction Methods

- (a) Backfill Material
  - (i) The Contract Administrator shall be notified at least one (1) working day in advance of any backfilling operations. No backfill shall be placed against any concrete until accepted by the Contract Administrator.
  - (ii) All backfill material shall be placed and compacted in lifts of 300 mm (maximum) to the minimum percent of Standard Proctor Dry Density specified on the Drawings and/or City Standards.
  - (iii) Flowable cement-stabilized fill shall be placed and tested as specified in CW 2160.
  - (iv) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

- (v) The Standard Proctor Density for granular shall be determined at the optimum moisture content in accordance with ASTM Standard D698 (latest revision).
  - (vi) The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard, Test for Density of Soil in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.
  - (vii) The frequency and number of tests to be made shall be as determined by the Contract Administrator.
- (b) Heating for Backfill
- (i) In locations of frozen subgrade, the Contractor shall preheat the subgrade prior to placement of granular backfill such that a minimum of 300 mm of unfrozen subgrade material is present during placement and compaction of backfill.
  - (ii) The Contractor shall pre-heat all backfill such that it is placed and compacted in an unfrozen state.
  - (iii) For subsequent lifts of backfill, the previous lift(s) will be considered the subgrade, and the requirements for unfrozen subgrade shall apply.
  - (iv) Heating for Backfill and/or Subgrade shall be considered incidental to Structural Backfill.
- (c) Installing Geotextile Fabric
- (i) Geotextile fabric shall be installed in accordance with CW 3130, and as shown on the Drawings.
  - (ii) Installation of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

#### E61.8 Quality Control

- (i) 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 thereto notwithstanding any inspection or acceptance that may have previously been given. The Contract Administrator reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification.
- (ii) The Contract Administrator shall be afforded full access for the inspection and control testing of constituent materials both at the Site of the Work and at any plant used for production of the materials to determine whether the material is being supplied and placed in accordance with this Specification.
- (iii) Any backfill material that does not meet the gradation and/or compaction requirements of this Specification shall be removed and replaced by the Contractor at his own expense, to the satisfaction of the Contract Administrator.

#### E61.9 Measurement and Payment

- (a) The backfilling required underneath the sidewalk pathway shown on the Drawings will not be measured and will be paid for at the Contract Lump Sum Price for the "Structural Backfill - Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) Native soil compaction of the subgrade below and around the reinforced concrete box culvert, head walls, and retaining wall, as indicated on the Drawings, shall be considered incidental to Structural Backfill.
- (c) The HDPE perforated drains and geotextile filter socks shall be considered incidental to Structural Backfill.
- (d) Items of Work:
  - (i) Granular Base Course Material

(ii) Drainage Fill & HDPE Perforated Drain;