

Canada 

Manitoba 



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 295-2010**

**2010 ACTIVE TRANSPORTATION - INFRASTRUCTURE STIMULUS PROGRAM  
SILVER AVENUE, MORAY STREET AND SHERWIN ROAD MULTI-USE PATHS**

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## **PART B - BIDDING PROCEDURES**

### **B1. CONTRACT TITLE**

- B1.1 2010 Active Transportation - Infrastructure Stimulus Program Silver Avenue, Moray Street and Sherwin Road Multi-Use Paths

### **B2. SUBMISSION DEADLINE**

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 19, 2010.
- 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.
- B3.2 The Bidder is advised that the City has not confirmed acquisition of all the property required to complete Silver Avenue. The unconfirmed property includes the entirety of the right-of-way from approximately Station 16+52 (105 metres west of Ladywood Drive) through to Station 12+44 (Air Force Way).

### **B4. ENQUIRIES**

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.
- B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.
- B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.
- B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.
- B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

### **B5. ADDENDA**

- B5.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>

B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B5.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

## **B6. SUBSTITUTES**

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

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

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

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

- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
- (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
- (c) identify any anticipated cost or time savings that may be associated with the substitute;
- (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
- (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

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

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

B6.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.

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

B6.8 If the Contract Administrator approves a substitute as an "approved alternative", any Bidder bidding that approved alternative may base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B15.

- B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.
- B6.10 Notwithstanding B6.2 to B6.9, in accordance with B7.6, deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

## **B7. BID COMPONENTS**

- B7.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
  - (b) Form B: Prices, 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;
- B7.2 Further to B7.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B6.
- B7.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.
- B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B7.4.2 A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.
- B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.
- B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).
- B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.8 Bids shall be submitted to:
- The City of Winnipeg  
Corporate Finance Department  
Materials Management Division  
185 King Street, Main Floor  
Winnipeg MB R3B 1J1

## **B8. BID**

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

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

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

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

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

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

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

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

## **B9. PRICES**

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

B9.1.1 For the convenience of Bidders, and pursuant to B7.4.2 and B15.4.3, 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>

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

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

B9.4 Prices from Non-Resident Bidders are subject to a Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

## **B10. QUALIFICATION**

B10.1 The Bidder shall:

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

B10.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B10.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B10.4 Further to B10.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

- (a) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
- (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>)

B10.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B10.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

## **B11. BID SECURITY**

B11.1 The Bidder shall provide bid security in the form of:

- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
- (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or



- (c) a certified cheque or draft payable to “The City of Winnipeg”, in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.
- B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B11.1.2 All signatures on bid securities shall be original.
- B11.1.3 The Bidder shall sign the Bid Bond.
- B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.
- B11.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.
- B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.
- B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.
- B11.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

## **B12. OPENING OF BIDS AND RELEASE OF INFORMATION**

- B12.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.
  - B12.1.1 Bidders or their representatives may attend.
  - B12.1.2 Bids determined by the Manager of Materials, or his designate, to not include the bid security specified in B11 will not be read out.
- B12.2 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>
- B12.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>
- B12.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

## **B13. IRREVOCABLE BID**

- B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B13.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work

until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

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

- B14.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B14.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B14.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
  - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
  - (c) if the notice has been given by any one of the persons specified in B14.1.3(b), declare the Bid withdrawn.
- B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

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

- B15.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation therefrom (pass/fail);
  - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B10 (pass/fail);
  - (c) Total Bid Price;
  - (d) economic analysis of any approved alternative pursuant to B6.
- B15.2 Further to B15.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.
- B15.3 Further to B15.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.
- B15.4 Further to B15.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.
- B15.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.

- B15.4.2 Further to B15.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.
- B15.4.3 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

## **B16. AWARD OF CONTRACT**

- B16.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B16.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.
- B16.2.1 Without limiting the generality of B16.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
  - (b) the prices are materially in excess of the prices received for similar work in the past;
  - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
  - (d) only one Bid is received; or
  - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B15.
- B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.

## PART C - GENERAL CONDITIONS

### C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at [http://www.winnipeg.ca/matmgt/gen\\_cond.stm](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*.
- C0.3

## **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) Multi-Use Pathway Construction.

(i) Silver Avenue from Sturgeon Road to Ferry Road, Alternating Sides

(ii) Moray Street from Ness Avenue to Murray Park Road, East Side

(iii) Sherwin Road from Saskatchewan Avenue to Notre Dame Avenue, West Side

D2.2 The City has not confirmed acquisition of all the property required to complete Silver Avenue. A portion of the Work along Silver Avenue is contingent upon confirmation of the acquisition of the property.

D2.2.1 Further to C7.1, if the property acquisition is not confirmed in time to construct, the City shall have the right to eliminate this portion of Work along Silver Avenue, and the Contract Price will be reduced accordingly.

D2.2.2 Further to C7.1, C7.5.1 and C7.6, a reduction in the Contract Price pursuant to D2.2.1 shall not be considered in calculating the aggregate reduction in the Contract Price for purposes of C7.5.

D2.3 The major components of the Work are as follows:

(a) Multi-Use Pathway Construction

(i) Tree removal

(ii) Excavation

(iii) Compaction of existing sub-grade

(iv) Installation of separation/reinforcement fabric

(v) Placement of sub-base and base course materials

(vi) Adjustment of existing drainage inlets, water valves, manholes and catchbasins

(vii) Placement of asphalt pavement (average thickness – 75mm)

(viii) Construction of concrete sidewalk

(ix) Installation of culverts

(x) Construction of bridge over Truro Creek (Silver Avenue Multi-Use Path)

(xi) Ditch re-grading, topsoil, sod and seeding

(xii) Boulevard Restoration

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

D3.1 The Contract Administrator is KGS Group, represented by:

Craig Rowbotham, P. Eng.

Project Manager

3<sup>rd</sup> Floor – 865 Waverley Street

Winnipeg Mb R3T 5P4

Telephone No. (204) 896-1209

Facsimile No. (204) 896-0754

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

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

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

D4.2 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 D4.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

#### **D5. NOTICES**

D5.1 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.

D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3, D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.

D5.3 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 address or facsimile number:

The City of Winnipeg  
Chief Financial Officer  
Administration Building, 3rd Floor  
510 Main Street  
Winnipeg MB R3B 1B9  
Facsimile No.: (204) 949-1174

D5.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

The City of Winnipeg  
Internal Services Department  
Legal Services Division  
Attn: City Solicitor  
185 King Street, 3rd Floor  
Winnipeg MB R3B 1J1  
Facsimile No.: (204) 947-9155

#### **D6. FURNISHING OF DOCUMENTS**

D6.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

## **SUBMISSIONS**

### **D7. AUTHORITY TO CARRY ON BUSINESS**

D7.1 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.

### **D8. SAFE WORK PLAN**

D8.1 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.

D8.2 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>

### **D9. INSURANCE**

D9.1 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, The Province of Manitoba and The Government of Canada including authorized officials and representatives of the aforementioned, added as an additional insureds; such liability policy to contain a cross-liability clause, contractual liability, unlicensed motor vehicle liability (contractors' equipment), 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;
  - (i) Completed operations cover shall extend for a minimum of twenty-four (24) months beyond Total Performance date;
  - (ii) The policy shall provide coverage for the aforementioned entities as well as all contractors and consultants and their directors, officers, employees and agents. A wrap-up liability policy, covering the entire scope of the Work may be purchased in place of a commercial general liability policy;
- (b) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars (\$2,000,000.00) to be retained at all times during the performance of the Work and until the date of Total Performance; such insurance may be met through the commercial general liability cover where applicable;
- (c) Builder's Risk insurance (Broad Form) including testing and commissioning, in the amount of one hundred percent (100%) of the total construction costs; written in the name of the Contractor, The City of Winnipeg and all other contractors, sub-contractors, engineering and architectural consultants etcetera;
- (d) any other insurances, carrying suitable limits and deductibles, as may be required to cover the scope of Work.

D9.2 All Policies shall be taken out with insurers licensed to and carrying on business in the Province of Manitoba.

D9.3 Deductibles shall be borne by the Contractor.

- D9.4 The Contractor shall provide the Contract Administrator with a certificate of insurance of each policy, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work on the site.
- D9.5 The Contractor shall not cancel, or cause any such policy or policies to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.
- D9.6 The Contractor shall provide written notice to the City of Winnipeg of any material changes to their policies within thirty (30) days of the change taking effect.
- D9.7 The City shall have the right to alter the limits and/or coverage's as reasonably required from time to time during the continuance of this agreement.

#### **D10. PERFORMANCE SECURITY**

- D10.1 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.
- D10.1.1 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.
- D10.2 If the bid security provided in his Bid was not a certified cheque or draft pursuant to B11.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site and in no event later than the date specified in the C4.1 for the return of the executed Contract.

#### **D11. SUBCONTRACTOR LIST**

- D11.1 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.

#### **D12. EQUIPMENT LIST**

- D12.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at 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.

#### **D13. DETAILED WORK SCHEDULE**

- D13.1 The Contractor shall provide the Contract Administrator with a detailed work schedule (Form L: 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.

- D13.2 Further to D2.2, if all or part of the unconfirmed property acquisition is eliminated from the Work, the time periods stipulated in D18 for Substantial Performance of the Work and in D19 for Total Performance of the Work will not be reduced.

## **SCHEDULE OF WORK**

### **D14. COMMENCEMENT**

- D14.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D14.2 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 D7;
    - (ii) evidence of the workers compensation coverage specified in C6.15;
    - (iii) the twenty-four (24) hour emergency response phone number specified in D4.2.
    - (iv) the Safe Work Plan specified in D8;
    - (v) evidence of the insurance specified in D9;
    - (vi) the performance security specified in D9.1;
    - (vii) the subcontractor list specified in D11;
    - (viii) the equipment list specified in D12;
    - (ix) the detailed work schedule specified in D13; and
  - (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contractor has waived the requirement for a pre-construction meeting.
- D14.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

### **D15. WORKING DAYS**

- D15.1 Further to C1.1(gg);
- D15.1.1 The Contract Administrator will determine daily if a Working Day has elapsed and will record his assessment. On a weekly basis the Contract Administrator will provide the Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he agrees with the Contract Administrator's determination of the Working Days assessed for the report period.
- D15.1.2 Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

### **D16. RESTRICTED WORK HOURS**

- D16.1 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.
- D16.2 Further to clause 3.10 of CW 1130, the Contractor shall not Work within the Truro Creek bed prior to June 15, 2010. All Works following June 15, 2010 within the Truro Creek are to be in the dry.

## **D17. WORK BY OTHERS**

D17.1 Work by others on or near the Site will include but not necessarily be limited to:

- (a) City of Winnipeg Traffic Signals Branch – Removal or relocation of traffic signal base along Notre Dame Avenue median. It is expected that this work can be done at the same time as this project while sharing the project area.
- (b) Manitoba Hydro (Street Lighting) – Street lights must be relocated along Moray Street. This is expected to be completed prior to the commencement of the project;
- (c) Manitoba Hydro (Power) – Utility poles and guywires must be relocated near Conway Street. This is expected to be completed prior to the commencement of the project.
- (d) MTS – Adjustment to manhole along Moray Street near Strauss Drive. It is expected that this work can be done at the same time as this project while sharing the project area.

## **D18. SUBSTANTIAL PERFORMANCE**

D18.1 The Contractor shall achieve Substantial Performance within Sixty-five (65) consecutive Working Days of the commencement of the Work as specified in D14.

D18.2 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.

D18.3 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.

## **D19. TOTAL PERFORMANCE**

D19.1 The Contractor shall achieve Total Performance within Seventy (70) consecutive Working Days of the commencement of the Work as specified in D14.

D19.2 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.

D19.3 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.

## **D20. LIQUIDATED DAMAGES**

D20.1 If the Contractor fails to achieve Substantial Performance in accordance with the Contract by the day fixed herein for Substantial Performance, the Contractor shall pay the City two thousand dollars (\$2000) per Working Day for each and every Working Day following the day fixed herein for Substantial Performance during which such failure continues.

D20.2 The amount specified for liquidated damages in D20.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.

D20.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

## **D21. SCHEDULED MAINTENANCE**

- D21.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Reflective Crack Maintenance as specified in CW 3250-R7;
  - (b) Sodding (maintenance period) as specified in CW 3510-R9; and
  - (c) Seeding (maintenance period) as specified in CW 3520-R7.
- D21.2 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**

### **D22. JOB MEETINGS**

- D22.1 Regular weekly job meetings will be held on 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.
- D22.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

### **D23. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)**

- D23.1 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).

## **WARRANTY**

### **D24. WARRANTY**

- D24.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.
- D24.2 Notwithstanding C13.2 or D24.1, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:
- (a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use; or
- D24.2.1 In such case the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

**FORM H1: PERFORMANCE BOND**  
(See D9.1)

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. 295-2010

2010 Active Transportation - Infrastructure Stimulus Program Silver Avenue, Moray Street and Sherwin Road Multi-Use Paths

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)



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

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

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

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

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

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

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

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

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





**FORM K: EQUIPMENT**  
(See D12)

2010 Active Transportation - Infrastructure Stimulus Program Silver Avenue, Moray Street and Sherwin Road Multi-Use Paths

**1. Category/type: All Equipment Working in Vicinity of the Silver Avenue Feedermain**

List all significant equipment (backhoes, typical haul trucks, concrete or asphalt pavers, etc.) that will be used in the vicinity of feedermain. Additional sheets or equipment diagrams can be used to supplement.

Equipment Type: \_\_\_\_\_ Make/Model: \_\_\_\_\_

Tare (Operating) Weight: \_\_\_\_\_ Payload Weight: \_\_\_\_\_

Equipment axle and load configuration (text or diagram):

Equipment Type: \_\_\_\_\_ Make/Model: \_\_\_\_\_

Tare (Operating) Weight: \_\_\_\_\_ Payload Weight: \_\_\_\_\_

Equipment axle and load configuration (text or diagram):

Equipment Type: \_\_\_\_\_ Make/Model: \_\_\_\_\_

Tare (Operating) Weight: \_\_\_\_\_ Payload Weight: \_\_\_\_\_

Equipment axle and load configuration (text or diagram):

Equipment Type: \_\_\_\_\_ Make/Model: \_\_\_\_\_

Tare (Operating) Weight: \_\_\_\_\_ Payload Weight: \_\_\_\_\_

Equipment axle and load configuration (text or diagram):

Equipment Type: \_\_\_\_\_ Make/Model: \_\_\_\_\_

Tare (Operating) Weight: \_\_\_\_\_ Payload Weight: \_\_\_\_\_

Equipment axle and load configuration (text or diagram):



## 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)<br/>Sheet Size</u> |
|--------------------|---|--|
|                    | Cover Sheet   |  |
| 01                 | Silver Ave. – Sturgeon Rd. to Moray St.<br>STA. 1+00 to STA. 3+25     | 594mm x 841mm                            |
| 02                 | Silver Ave. – Sturgeon Rd. to Moray St.<br>STA. 3+25 to STA. 5+75     | 594mm x 841mm                            |
| 03                 | Silver Ave. – Sturgeon Rd. to Moray St.<br>STA. 5+75 to STA. 8+75     | 594mm x 841mm                            |
| 04                 | Silver Ave. – Sturgeon Rd. to Moray St.<br>STA. 8+75 to STA. 11+75    | 594mm x 841mm                            |
| 05                 | Silver Ave. – Sturgeon Rd. to Moray St.<br>STA. 11+75 to STA. 14+75   | 594mm x 841mm                            |
| 06                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 14+75 to STA. 17+75  | 594mm x 841mm                            |
| 07                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 17+75 to STA. 20+60  | 594mm x 841mm                            |
| 08                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 20+60 to STA. 23+75  | 594mm x 841mm                            |
| 09                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 23+75 to STA. 26+75  | 594mm x 841mm                            |
| 10                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 26+75 to STA. 29+75  | 594mm x 841mm                            |
| 11                 | Silver Ave. – Moray St. to Air Force Way<br>STA. 29+75 to STA. 32+75  | 594mm x 841mm                            |
| 12                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 32+75 to STA. 34+75 | 594mm x 841mm                            |
| 13                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 34+75 to STA. 36+75 | 594mm x 841mm                            |
| 14                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 36+75 to STA. 39+25 | 594mm x 841mm                            |
| 15                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 39+25 to STA. 40+35 | 594mm x 841mm                            |
| 16                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 39+25 to STA. 42+00 | 594mm x 841mm                            |
| 17                 | Silver Ave. – Air Force Way to Ferry Road<br>STA. 42+00 to STA. 45+50 | 594mm x 841mm                            |
| 18                 | Silver Ave. – Air Force Way to Ferry Road                             | 594mm x 841mm                            |

| <u>Drawing No.</u> | <u>Drawing Name/Title</u>   | <u>Drawing (Original)<br/>Sheet Size</u> |
|--------------------|---|--|
| 19                 | STA. 45+50 to STA. 47+52<br>Moray St. – Ness Ave. to Murray Park Rd.          | 594mm x 841mm                            |
| 20                 | STA. 1+00 to STA. 3+25<br>Moray St. – Ness Ave. to Murray Park Rd.            | 594mm x 841mm                            |
| 21                 | STA. 3+25 to STA. 6+25<br>Moray St. – Ness Ave. to Murray Park Rd.            | 594mm x 841mm                            |
| 22                 | STA. 6+25 to STA. 8+21<br>Sherwin Rd. – Saskatchewan Ave. to Notre Dame Ave.  | 594mm x 841mm                            |
| 23                 | STA. 1+00 to STA. 3+25<br>Sherwin Rd. – Saskatchewan Ave. to Notre Dame Ave.  | 594mm x 841mm                            |
| 24                 | STA. 3+25 to STA. 6+00<br>Sherwin Rd. – Saskatchewan Ave. to Notre Dame Ave.  | 594mm x 841mm                            |
| 25                 | STA. 6+00 to STA. 8+50<br>Sherwin Rd. – Saskatchewan Ave. to Notre Dame Ave.  | 594mm x 841mm                            |
| 26                 | STA. 8+50 to STA. 10+75<br>Sherwin Rd. – Saskatchewan Ave. to Notre Dame Ave. | 594mm x 841mm                            |
|                    | STA. 10+75 to STA. 12+86<br>Truro Creek Bridge – Location Plan                | 594mm x 841mm                            |
| B238-10-01_Sht27   | Truro Creek Bridge – Elevation, Plan and Cross Section                        | 594mm x 841mm                            |
| B238-10-01_Sht28   | Truro Creek Bridge – Abutment and Approach Slab                               | 594mm x 841mm                            |
| B238-10-01_Sht29   | Truro Creek Bridge – Deck Slab, Curbs & Expansion                             | 594mm x 841mm                            |
| B238-10-01_Sht30   | Assembly  | 594mm x 841mm                            |
| B238-10-01_Sht31   | Truro Creek Bridge – Girders and Diaphragms                                   | 594mm x 841mm                            |
| B238-10-01_Sht32   | Truro Creek Bridge – Aluminum Pedestrian Handrail                             | 594mm x 841mm                            |
| 33                 | Truro Creek Bridge – Bank Stabilization                                       | 594mm x 841mm                            |
| 34                 | Truro Creek Bridge – West Embankment  | 594mm x 841mm                            |
| 35                 | Truro Creek Bridge – East Embankment  | 594mm x 841mm                            |

## **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. PROTECTION OF EXISTING TREES**

- E3.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:
- (a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
  - (b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.
  - (c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.
  - (d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
  - (e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E3.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his designate.

E3.3 No separate measurement or payment will be made for the protection of trees.

E3.4 Except as required in clause E3.1(c) and E3.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

#### **E4. TRAFFIC CONTROL**

E4.1 Further to clauses 3.6 and 3.7 of CW 1130:

- (a) Where directed, 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 in Work Areas on City Streets, the Contractor ("Agency" in the manual) shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place all temporary regulatory signs. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

#### **E5. TRAFFIC MANAGEMENT**

E5.1 Further to clause 3.7 of CW 1130:

E5.1.1 The Contractor shall schedule construction activities to meet the following:

- (a) Intersecting street and private approach access shall be maintained at all times.

E5.1.2 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E5.1.3 Pedestrian and ambulance/emergency vehicle access must be maintained at all times.

#### **E6. PEDESTRIAN SAFETY**

E6.1 During the project, a temporary snow fence shall be installed adjacent to existing and temporary sidewalks as necessary to prevent access to the construction area. The Contractor shall be responsible for maintaining the snow fence in a proper working condition. No measurement for payment shall be made for this work.

#### **E7. WATER USED BY CONTRACTOR**

E7.1 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.

#### **E8. SURFACE RESTORATIONS**

E8.1 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.

**E9. TRAFFIC GRAVEL AS SUB-BASE FOR TRIAL PROJECTS**

DESCRIPTION

E9.1 General

E9.1.1 Further to CW 3110, this specification covers supply and placement of traffic gravel sub-base material under roads, asphalt pathways and concrete sidewalks.

E9.2 Definitions

E9.2.1 Deleterious material – are materials such as vegetation, organic material, wood, glass, plastic, metal, reinforcing steel, building rubble, brick, salvaged asphalt materials, clay, shale, and friable particles.

E9.3 Referenced Standard Construction Specifications

- (a) CW 3110 – Sub-Grade. Sub-Base and Base Course Construction.
- (b) CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints.
- (c) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs.
- (d) CW 3325 – Portland Cement Concrete Sidewalk.

MATERIALS

E9.4 Traffic Gravel

E9.4.1 Traffic gravel sub-base material will be approved by the Contract Administrator.

E9.4.2 Traffic gravel sub-base material will consist of sound durable particles produced by crushing, screening, and grading of recovered concrete materials, free from soft material that would disintegrate through decay or weathering.

E9.4.3 The traffic gravel sub-base material will be well graded and conform to the following grading requirements:

**Traffic Gravel Grading Requirements**

| CANADIAN METRIC SIEVE SIZE | PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE |
|----------------------------|--|
| 20 000                     | 100%   |
| 12 500                     | 75% - 90%                                      |
| 5 000                      | 40% - 70%                                      |
| 1 250                      | 20% - 50%                                      |
| 630                        | 15% - 40%                                      |
| 80                         | 5% - 15%                                       |

E9.4.4 Traffic gravel sub-base material when subjected to the abrasion test will have a loss of not more than 35% when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

E9.4.5 Material retained on the No. 5 000 sieve will contain not less than 35% crushed aggregate as determined by actual particle count. Crushed aggregate will be considered as that aggregate having at least one fractured face.

E9.4.6 The amount of deleterious material will be limited to a maximum of two percent of the total dry weight.

CONSTRUCTION METHODS

E9.5 Placement of Traffic Gravel Material

- E9.5.1 Spread materials uniformly to avoid segregation free of pockets of fine and coarse material.
- E9.5.2 Level and compact to the finished elevation. Compact to 100% Standard Proctor Density for roads and asphalt pathways and to 90% Standard Proctor Density for concrete sidewalks.
- E9.5.3 Maintain the finished material until the pavement or sidewalk is placed.

#### MEASUREMENT AND PAYMENT

- E9.6 Traffic Gravel Material
  - E9.6.1 The supplying, placing and compaction of traffic gravel material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the "Supplying and Placing Traffic Gravel" as specified.
  - E9.6.2 No measurement or payment will be made for materials rejected by the Contract Administrator.

#### **E10. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO THE SILVER AVENUE FEEDERMAINS**

- E10.1 Description
  - E10.1.1 This Specification details operating constraints for all Work to be carried out in close proximity to the Silver Avenue Feeder mains. Close proximity shall be deemed to be any construction activity within a 5 m offset from the centreline of the Feeder mains.
- E10.2 General Considerations for Work in Close Proximity to the Silver Avenue Feeder mains
  - E10.2.1 The Silver Avenue Feeder mains are a critical component of the City of Winnipeg Regional Water Supply System and Work in close proximity to the pipeline shall be undertaken with an abundance of caution. The pipe cannot be taken out of service to facilitate construction and inadvertent damage caused to the pipes would likely have catastrophic consequences.
  - E10.2.2 Work around the Feeder mains shall be planned and implemented to minimize the time period that Work is carried out in close proximity to it 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
  - E10.2.3 The 900mm Silver Avenue Feeder main is constructed of Prestressed Concrete Cylinder Pipe conforming to AWWA Standard C301. This section of the pipeline was installed in approximately 1987.
  - E10.2.4 The 400mm Silver Avenue Feeder main is constructed of Asbestos Cement. The installation date of this pipe is unknown.
  - E10.2.5 AWWA C301 pipe 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.
  - E10.2.6 Loading limitations and calculated loads associated with typical construction equipment are attached to this Specification as Appendix A. The loading calculations shall be interpreted with caution, however, as many factors can cause applied loads to increase considerably, such as unbalanced loading, variations in wheel base or track width, payload, impact factors due to excessive speed or vibration, etc.
  - E10.2.7 Generally, loading conforming to legal highway loading for adjacent roadways or AASHTO HS 20 loading will be permitted, subject to review as outlined in Submittals section below.
- E10.3 Submittals
  - E10.3.1 Submit proposed construction equipment specifications to the Contract Administrator for review seven (7) days prior to construction. Submittal shall include:

- (a) Equipment operating weight and dimensions including wheel or track base, track length or axle spacing, track widths or wheel configurations;
- (b) Payload weights; and
- (c) Load distributions in the intended operating configuration.

E10.3.2 Submit a Construction Method Statement with proposed construction plan including material haul routes, excavation equipment locations, loading positioning and base construction sequencing to the Contract Administrator for review seven (7) days prior to construction. Do not commence construction until the Construction Method Statement has been reviewed and accepted by the Contract Administrator.

E10.3.3 The Contract Administrator will review the equipment and construction method statement in light of the Feeder mains loading limitations.

#### E10.4 Protection of the Silver Avenue Feeder mains During Construction

E10.4.1 Pipe locations noted on the Drawings are based on the original record drawings. At the request of the Contract Administrator the Contractor shall verify the Feeder main locations and obvert elevations by soft excavation methods (hydrovac or hand digging) at locations identified by the Contract Administrator.

E10.4.2 Contractors carrying out repair Work or Working in close proximity to the Feeder mains shall meet the following conditions and technical requirements:

- (a) Pre-Work, Planning and General Execution
  - (i) No Work shall commence at the site until the Construction Method Statement has been accepted and the Feeder main locations have been clearly delineated in the field.
  - (ii) Work shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications by the Contract Administrator.
  - (iii) For transverse crossings of the Feeder mains in support of pathway construction activities, designate crossing locations and confine equipment crossing the pipe(s) to these locations. Reduce equipment speeds to levels that minimize the impacts of impact loading.
  - (iv) For construction Work activities either longitudinally or transverse to the alignment of the Feeder mains, work only with equipment and in the manner stipulated in the accepted Construction Method Statement and the supplemental requirements noted herein.
  - (v) Subgrade, subbase and base 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.
  - (vi) Granular material, construction material, soil or other material shall not stockpiled on the pipelines or within 5 metres of the pipe centerline.
  - (vii) Stage construction such that the Feeder mains are not subjected to significant asymmetrical loading at any time.
  - (viii) Where Work is in proximity to the Feeder mains, utilize construction practices and procedures that do not impart excessive vibration loads on the Feeder mains or that would cause settlement of the subgrade below the Feeder mains.
- (b) Excavation
  - (i) Where there is less than 2.5 m of cover over a Feeder main, offset backhoe from Feeder main, a minimum of 2.5 m from Feeder main centerline, to carry out excavation.
  - (ii) Where there is less than 1.5 metres of earth cover over a Feeder main and further excavation is required either adjacent to or over a Feeder main, utilize only smooth edged excavation buckets, soft excavation or hand excavation techniques and continue offset excavation.



- (iii) Excavated materials intended for reuse shall not be dumped directly on pipelines but shall be carefully bladed in place.
- (c) Subgrade Construction
  - (i) Subgrade compaction shall be limited to static compaction methods and only with equipment that are well within the rated loading superimposed loading capacity of the Feeder mains.
  - (ii) Stage Work activities to minimize the time period that unprotected subgrade is exposed to the environment and protect the subgrade against the impacts of adverse weather if subbase/ base course construction activities are not sequential with excavation.
- (d) Subbase and Base Course Construction
  - (i) Subbase or base course materials shall not be dumped directly on pipelines but shall be carefully bladed in-place.
  - (ii) Subbase compaction 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.

#### E10.5 Compliance With the Specification

- E10.5.1 The Contractor shall ensure that all Work crew members understand and observe the requirements of this specification. Prior to commencement of on-site Work, the Contractor shall jointly conduct an orientation meeting with the Contractor Administrator with all superintendents, foremen and heavy equipment operators to make all Workers on site are fully cognizant of the limitations of altered loading on the Feeder mains, the ramifications of inadvertent damage to the pipelines, the constraints associated with Work in close proximity to the Feeder mains and the specific details of the Construction Method Statement in instances where a Construction Method Statement is in effect.
- E10.5.2 Employees of the Contractor or any Subcontractor that fail to comply with the conditions for Working in close proximity to the Feeder mains shall be promptly removed from the Site.

#### E10.6 Measurement and Payment

- E10.6.1 Soft Excavation shall be paid for at the Contract Unit Price per hour for "Soft Excavation". The units to be paid for will be the total number of hours for soft dig excavation in accordance with this Specification, accepted and measured by the Contract Administrator.

### **E11. TREE REMOVAL**

#### DESCRIPTION

##### E11.1 General

- E11.1.1 This specification covers the removal of existing trees.

#### CONSTRUCTION METHODS

##### E11.2 Tree Removal

- E11.2.1 Contractor shall remove designated trees as directed by the Contract Administrator on an "as required" basis in accordance with the requirements hereinafter specified.
- E11.2.2 The Contractor shall not complete a tree removal unless they receive authorization from the Contract Administrator.
- E11.2.3 The Contractor shall remove trees in a manner satisfactory to the Contract Administrator or designate and agrees that the Work may be inspected by City personnel.
- E11.2.4 The Contractor shall cut down designated trees and grub out the stumps and rootballs.

- E11.2.5 The Contractor shall remove and/or dispose of all material resulting from the Work immediately by removing to a landfill site, or by chipping and removing material to an appropriate location.
- E11.2.6 The Contractor shall repair any damage resulting from the Work to adjacent trees and shall report all damage immediately to the Contract Administrator.

#### MEASUREMENT AND PAYMENT

- E11.3 Tree Removal will be measured on a unit basis and paid for at the Contract Unit Price per tree and associated stump/roots for "Removal of Trees". The number to be paid for will be the total number of trees and associated stump/roots removed and disposed of in accordance with this specification and accepted by the Contract Administrator

#### E12. PROTECTION OF FIBRE OPTIC CABLES

- E12.1 Further to CW 1120, the Contractor shall verify the location of fibre optic cables by exposing the cables using soft excavation methods (hydrovac or hand digging). The Contractor shall perform soft excavation at the locations required to verify the location, as determined by the Contract Administrator.
- E12.2 No separate or payment will be made for sift dig excavations for verifying locations of fibre optic cables. All costs associated with this work is considered incidental to the Work.

#### E13. SUPPLY AND INSTALL DETECTABLE WARNING SURFACE TILES

##### DESCRIPTION

- E13.1 This specification covers the supply and installation of detectable warning surface tiles in sidewalk ramps and multi-use path ramps.

##### SPECIFICATIONS AND DRAWINGS

- E13.2 Referenced Standard Construction Specifications and Standard Details
- (a) CW 3235 - Renewal of Existing Miscellaneous Concrete Slabs
  - (b) CW 3240 - Renewal of Existing Curbs
  - (c) CW 3310 - Portland Cement Concrete Pavement Works
  - (d) CW 3325 - Portland Cement Concrete Sidewalk
  - (e) SD-229C - Curb Ramp for Concrete Pavement
  - (f) SD-229D - Curb Ramp for Asphalt Overlay
- E13.3 Attached; SDE Drawings and Installation Manual
- (a) SDE-229A - Curb Ramp Layout for Intersections
  - (b) SDE-229AA - Detectable Warning Surface in Curb Ramps for Intersections
  - (c) SDE-229AB - Curb Ramp Layout for Offset Intersections
  - (d) SDE-229BB - Detectable Warning Surface in Curb Ramps for Medians
  - (e) SDE-229E - Curb Ramp Depressed Curb
  - (f) Manufacturer's Installation Manual – Armor-Tile Cast in Place Inline Dome Detectable/Tactile Warning Surface Tile.

##### MATERIALS

- E13.4 Acceptable Detectable Warning Surface Tile product is:
- E13.5 2'x 4' (610 x 1220mm) Armor-Tile Cast in Place (yellow).

Available from:

Engineered Plastics Inc.  
1400 Cornwall Road Unit 6  
Oakville, Ontario L6J 7W5

Attention: Manny Burgio  
Ph: 800-682-2525  
Fax: 800-769-4463

or

Alsip's Building Products  
1 Cole Avenue  
Winnipeg, Manitoba

Attention: Jason Alsip  
Ph. 204-667-3330

- E13.5.1 Detectable warning surface tiles shall be Highway Yellow (USA) or Safety Yellow (Canada).
- E13.5.2 Detectable warning surface tiles shall be cast in place type.
- E13.5.3 Truncated domes on detectable warning surface tiles shall be in accordance with ADA Accessibility Guidelines (ADAAG).

#### CONSTRUCTION METHODS

##### E13.6 General

- E13.6.1 Construct curb ramps, sidewalk ramps and multi-use path in accordance with referenced Standard Construction Specifications, Standard Details, and SDE drawings (attached).
- E13.6.2 Construct the lip of the depressed curb in accordance with SDE – 229E.
- E13.6.3 Construct sidewalk ramp grades in accordance with SD-229C and SD-229D.
- E13.6.4 Install the detectable warning surface tile in accordance with the amended Manufacturer's Installation Manual (attached). Drill additional 6mm air vent holes in ribs under the tile as required and use vibration to help seat the tile, to facilitate the installation process.
- E13.6.5 Trim the corner of the tile at radii in accordance with SDE-229A, SDE-229AA and SDE-228AB
- E13.6.6 Install and orient the detectable warning surface tiles as shown on the referenced drawings or as directed by the Contract Administrator.

##### E13.7 Medians and Refuge Islands:

- E13.7.1 Where the distance from back of curb to back of curb is 1.32m or greater, install one detectable warning surface tile 50mm from the back of each curb.
- E13.7.2 Where the distance from back of curb to back of curb is less than 1.32m, leaving 50mm between the back of curb and the tile, cut the tile(s) to fill the remaining area between the curbs.

##### E13.8 Multi-use Paths

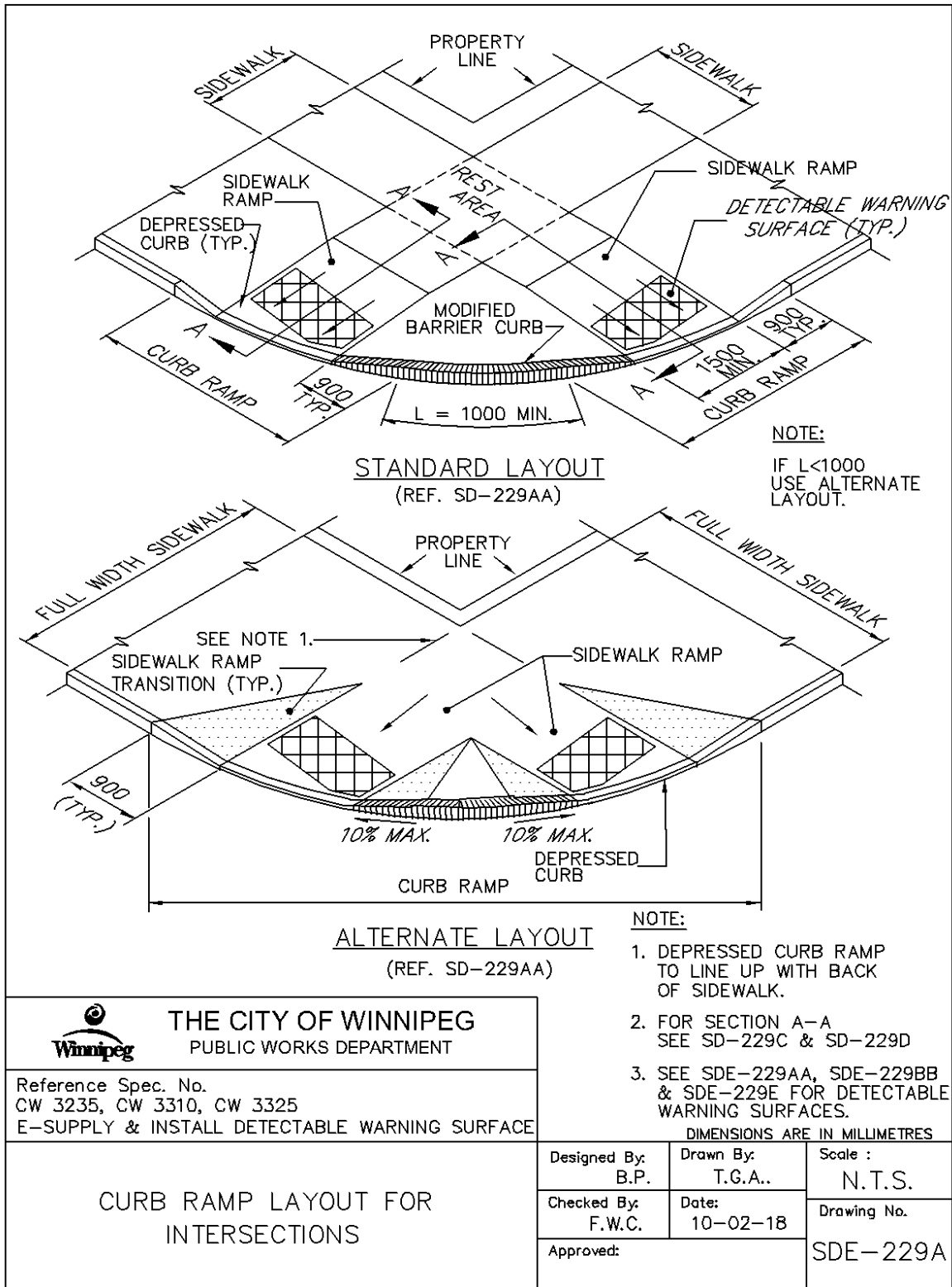
- E13.8.1 Construct a curb ramp with a depressed curb to the full width of the multi-use path in accordance with SDE-229E.


- E13.8.2 Construct a concrete ramp the width of the multi-use path and a minimum of 1.50m deep from back of curb in accordance with SD-229C and SD-229D.
- E13.8.3 Install two (2) tiles in each concrete ramp, one (1) on each side for each direction. Place the short edge of each tile 150mm from the edge of the concrete ramp, with both tiles in line with each other transversely across the concrete ramp. The tile(s) nearest the curb must be 50mm from back of curb similar to tile placement in SDE-229A.
- E13.8.4 Saw cut the middle of the concrete slab, perpendicular to the curb and to a depth of D/4. Cut additional sawcuts as directed by the Contract Administrator.

#### MEASUREMENT AND PAYMENT

- E13.9 Supply and installation of detectable warning surface tiles will be measured on a unit basis and paid for at the Contract Unit Price for "Detectable Warning Surface Tiles". The number of units to be paid for will be the total number of full or trimmed tiles supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- E13.9.1 The area under the detectable warning surface tile is part of the concrete sidewalk ramp and will be paid in accordance with CW 3235 and CW 3325.
- E13.9.2 The concrete sidewalk ramp and the concrete ramp for multi-use paths will be paid as 100mm sidewalk in accordance with CW 3235 or CW 3325.
- E13.9.3 Curb ramp will be paid in accordance with CW 3240 or CW 3310.

DRAWINGS AND INSTALLATION MANUAL

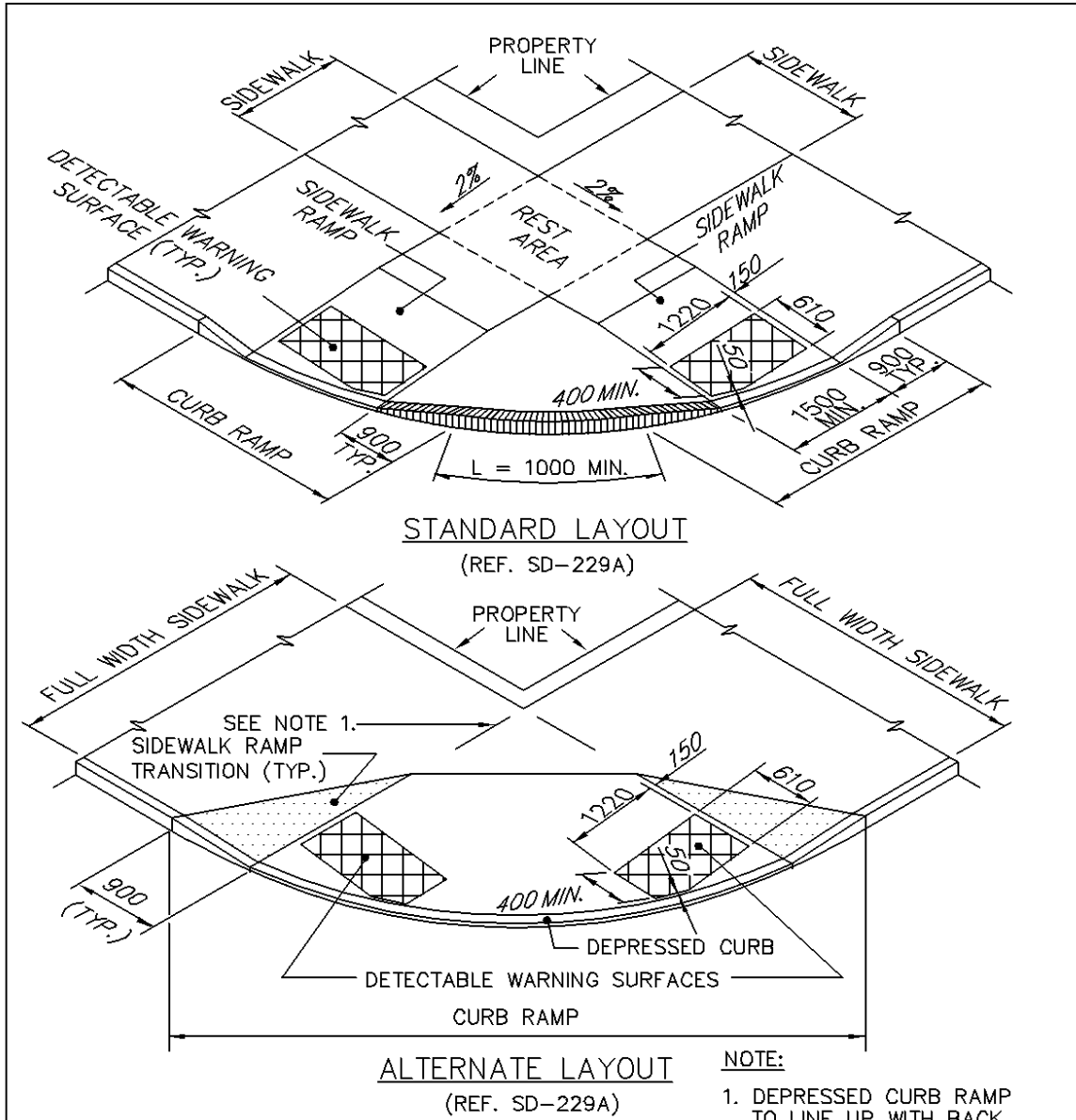



 **THE CITY OF WINNIPEG**  
 PUBLIC WORKS DEPARTMENT

Reference Spec. No.  
 CW 3235, CW 3310, CW 3325  
 E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE

**CURB RAMP LAYOUT FOR INTERSECTIONS**

|                       |                     |                  |
|-----------------------|---------------------|------------------|
| Designed By:<br>B.P.  | Drawn By:<br>T.G.A. | Scale:<br>N.T.S. |
| Checked By:<br>F.W.C. | Date:<br>10-02-18   | Drawing No.      |
| Approved:             |                     | SDE-229A         |

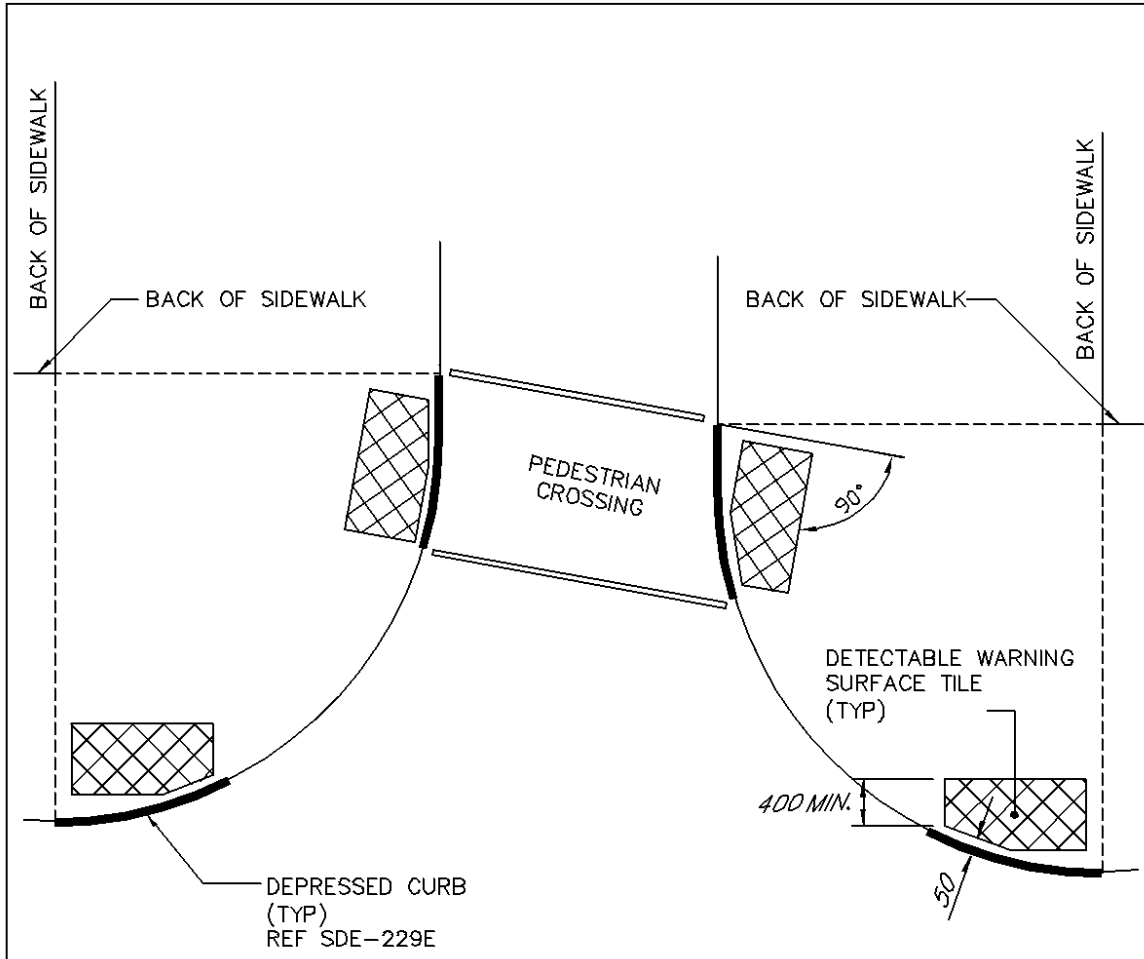


 **THE CITY OF WINNIPEG**  
 PUBLIC WORKS DEPARTMENT

Reference Spec. No.  
 CW 3235, CW 3310, CW 3325  
 E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE


DETECTABLE WARNING SURFACE  
 IN CURB RAMPS FOR  
 INTERSECTIONS

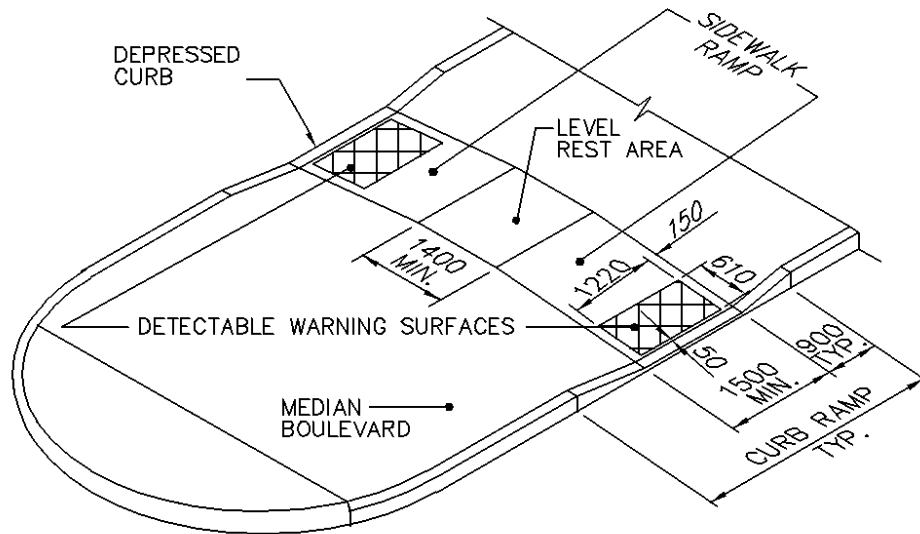
|                       |                     |                          |
|-----------------------|---------------------|--------------------------|
| Designed By:<br>B.P.  | Drawn By:<br>T.G.A. | Scale:<br>N.T.S.         |
| Checked By:<br>F.W.C. | Date:<br>10-02-18   | Drawing No.<br>SDE-229AA |
| Approved:             |                     |                          |



**NOTES:**

1. LOCATE GRATINGS, ACCESS COVERS AND OTHER APPURTENANCES OUTSIDE OF CURB RAMPS, DEPRESSED CURBS, CLEAR SPACE LANDINGS AND GUTTERS AS DIRECTED BY THE CONTRACT ADMINISTRATOR.
2. LOCATE END OF DEPRESSED CURB IN LINE WITH PROJECTED BACK OF SIDEWALK.


|  |   |                      |                          |
|--|---|----------------------|--------------------------|
|  <b>THE CITY OF WINNIPEG</b><br>PUBLIC WORKS DEPARTMENT | DIMENSIONS ARE IN MILLIMETRES   |                      |                          |
|  | Reference Spec. No.<br>CW 3235, CW 3310, CW 3325<br>E—SUPPLY & INSTALL DETECTABLE WARNING SURFACE | Designed By:<br>B.P. | Drawn By:<br>T.G.A.      |
| <b>CURB RAMP LAYOUT<br/>         FOR OFFSET INTERSECTIONS</b>  | Checked By:<br>F.W.C.   | Date:<br>10-02-18    | Drawing No.<br>SDE-229AB |
|  | Approved:   |                      |                          |



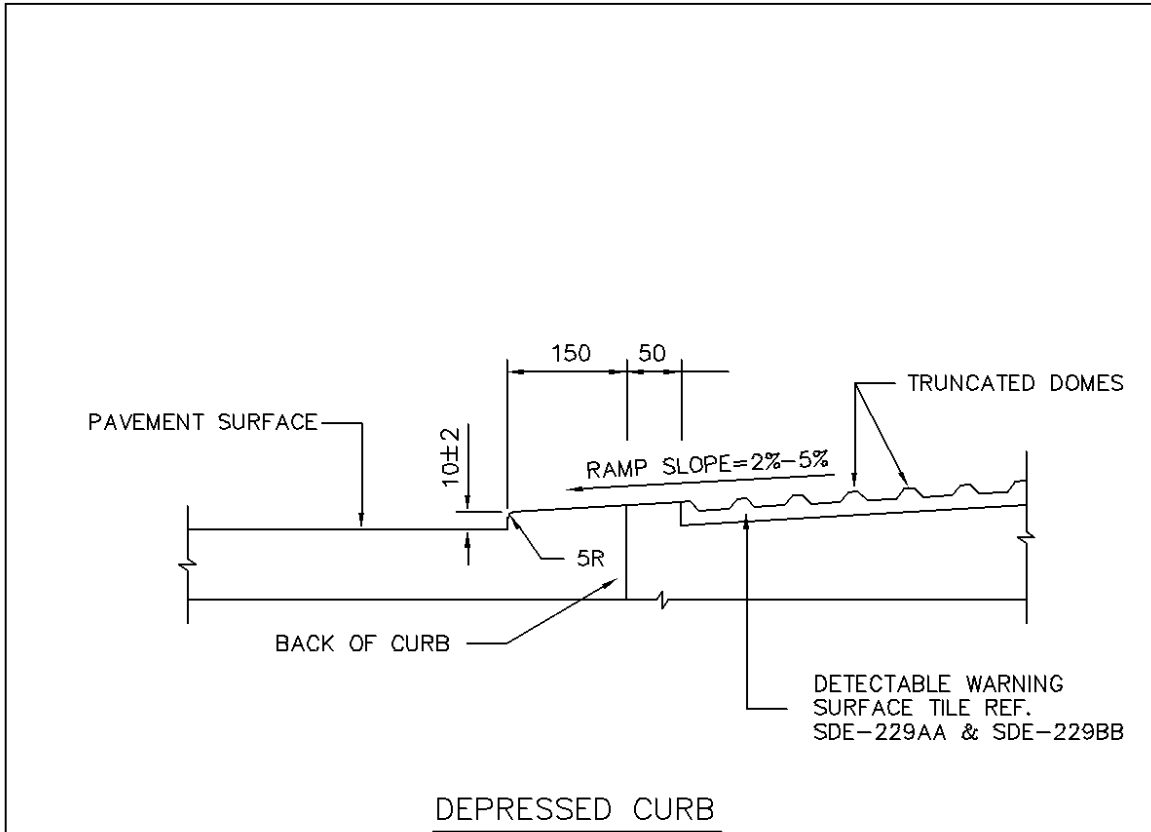
MEDIAN SIDEWALK CROSSING  
 (REF. SD-229B)

NOTE:

1. FOR NARROW MEDIANS AND REFUGE ISLANDS < 1.32m IN WIDTH, PLACE DETECTABLE WARNING SURFACE FULL WIDTH BETWEEN CURBS.
2. DETECTABLE WARNING SURFACE SHALL NOT BE PLACED AT PRIVATE APPROACHES OR ALLEYS.
3. FOR A 1.83m WIDE SIDEWALK, USE A DETECTABLE WARNING SURFACE TILE MEASURING 610 X 1520.


|  |  |                               |                     |                          |
|--|--|-------------------------------|---------------------|--------------------------|
|  <b>THE CITY OF WINNIPEG</b><br>PUBLIC WORKS DEPARTMENT |  | DIMENSIONS ARE IN MILLIMETRES |                     |                          |
| Reference Spec. No.<br>CW 3235, CW 3310, CW 3325<br>E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE  |  | Designed By:<br>B.P.          | Drawn By:<br>T.G.A. | Scale :<br>N.T.S.        |
| DETECTABLE WARNING SURFACE<br>IN CURB RAMPS FOR<br>MEDIANS   |  | Checked By:<br>F.W.C.         | Date:<br>10-12-18   | Drawing No.<br>SDE-229BB |
|  |  | Approved:                     |                     |                          |





NOTES:

- 1) SIDEWALK RAMP SURFACE SHALL BE GIVEN A PARALLEL TEXTURED BROOM FINISH.
- 2) INSTALL DETECTABLE WARNING SURFACE SO THAT THE TOP OF THE TRUNCATED DOMES ARE FLUSH WITH THE SURFACE FO THE ADJACENT SIDEWALK.

|   |  |                               |                     |                         |
|---|--|-------------------------------|---------------------|-------------------------|
|                | <b>THE CITY OF WINNIPEG</b><br>PUBLIC WORKS DEPARTMENT | DIMENSIONS ARE IN MILLIMETRES |                     |                         |
| Reference Spec. No.<br>CW 3235, CW 3310, CW 3325<br>E-SUPPLY & INSTALL DETECTABLE WARNING SURFACE |  | Designed By:<br>B.P.          | Drawn By:<br>T.G.A. | Scale :<br>N.T.S.       |
| CURB RAMP<br>DEPRESSED CURB   |  | Checked By:<br>F.W.C.         | Date:<br>10-02-18   | Drawing No.<br>SDE-229E |
|   |  | Approved:                     |                     |                         |

## Manufacturer's Installation Manual Armor-Tile Cast In Place

### Inline Dome Detectable/Tactile Warning Surface Tile

- A. During Cast In Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.
- B. The specifications of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.
- C. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 – 7 to permit solid placement of the Cast In Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.
- D. Prior to placement of the Cast In Place Detectable/Tactile Warning Surface Tile system, the contract drawings shall be reviewed.
- E. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast In Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.
- F. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.
- G. When preparing to set the tile, it is important that NO concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.
- H. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed in accordance with the contract drawings. The Cast In Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. ~~The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.~~
- I. In cold weather climates it is recommended that the Cast In Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.
- J. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates.
- K. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.
- L. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the tile that may rock the tile causing a void between the underside of tile and concrete.
- M. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each shall be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.
- N. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.
- O. If desired, individual tiles can be bolted together using ¼ inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.
- P. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.
- Q. ~~Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the detectability properties of the Armor-Tile system as required in various jurisdictions.~~

## E14. ROCKFILL RIPRAP

### E14.1 Description

E14.1.1 This Specification shall cover the supply and placement of rockfill riprap.

**E14.2 Materials**

E14.2.1 The rockfill material for use as riprap shall consist of a clean free draining, sound, dense, durable, crushed rock. The material shall be free from organics, roots, silts, sand, clay, snow, ice or any other material that would detract from the strength and drainage characteristics of clean rockfill.

E14.2.2 Individual particles shall be shaped such that no dimension is greater than two times the smallest dimension. Flat, elongated, or platy particle shapes will not be accepted.

E14.2.3 Should the Contractor choose to use limestone, it shall be durable white crystalline limestone. Softer buff to yellow dolomite or dolostone will not be accepted.

E14.2.4 The rockfill material shall meet the following requirements:

| Parameter             | Test Method | Specified Limit |
|-----------------------|-------------|-----------------|
| Bulk Specific Gravity | ASTM C127   | 2.6 minimum     |
| Absorption            | ASTM C127   | 2.5 % maximum   |
| LA Abrasion Loss      | ASTM C131   | 32% maximum     |
| Soundness             | ASTM C88    | 13% maximum     |
| Gradation             | ASTM D5519  | See below       |

E14.2.5 Rockfill riprap shall be well graded having a full range and even distribution of sizes and shall conform to the following gradation:

| <u>Canadian Metric Sieve Size (millimeters)</u> | <u>Percent of Total Dry Weight Passing Each Sieve</u> |
|---|---|
| 350   | 100%  |
| 200   | 15-50%  |
| 100   | 0-15%   |

**E14.3 Submittals**

E14.3.1 The Contractor shall submit the proposed supplier(s) and location of quarry Sites for supply of riprap.

E14.3.2 Representative samples of the rockfill riprap submitted for material testing purposes shall be completed as specified herein.

**E14.4 Quarry Sites**

E14.4.1 Contractors supplying rockfill riprap shall be responsible for demonstrating that the material is of adequate quality and volume to meet the material specifications contained herein.

**E14.5 Testing and Approval**

E14.5.1 All materials set forth in 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 for any materials taken by the Contract Administrator for testing purposes.

E14.5.2 The Contract Administrator will visit proposed quarry Sites for inspection of the proposed rockfill material and quarry faces a minimum of fourteen (14) days prior to supply and placement of riprap.

E14.5.3 No supply and placement of riprap will be permitted prior to the Contract Administrator reviewing the source.

E14.5.4 The procedures for preparation of all rockfill samples for use in material inspection and testing shall be subject to review and acceptance by the Contract Administrator for individual tests. The samples may be obtained from crushed and processed material at the sizing necessary for specific tests if the material is deemed to be representative of the riprap that will be used, subject to the acceptance of the Contract Administrator.

E14.5.5 The testing frequency necessary to confirm the material quality will be specified at the discretion of the Contract Administrator.

#### E14.6 Construction Methods

E14.6.1 Rockfill Riprap shall be placed at all locations as shown on the Drawings.

E14.6.2 Rockfill Riprap shall be pushed or rolled into place in such a manner that the larger rocks are uniformly distributed and the smaller rocks serve to fill the places between the larger rocks such that excessive segregation of the various particle sizes does not occur.

E14.6.3 Sufficient levelling shall be done to produce a neat and uniform surface, conforming to the shape and dimensions shown on the Drawings.

E14.6.4 The allowable fill tolerances shall be within  $\pm 50$  mm of the grades and thickness shown on the Drawings, provided positive downslope grading is achieved.

E14.6.5 Provide a smooth uniform surface from the existing grade and new riprap when placing outside edges or transitions, as accepted by the Contract Administrator.

E14.6.6 Temporary stockpiling of riprap along the riverbank shall not be permitted. Material shall be placed to the required lines and grade shown the Drawing immediately upon delivery to the Site.

#### E14.7 Method of Measurement

E14.7.1 The supply and placement of the Rockfill Riprap will be measured on a weight basis. The weight to be paid shall be the total number of metric tonnes of Rockfill Riprap material, supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as measured on a certified weigh scale.

E14.7.2 The Contractor shall provide the weigh tickets to the Contract Administrator for the material supplied to the site at the time of delivery. No payment will be made for any weigh tickets that are not supplied at the time of delivery.

#### E14.8 Basis of Payment

E14.8.1 Rockfill Riprap will be paid for at the Contract Unit Price for "Rockfill Riprap", measured as specified herein, which price shall be payment in full for performing all operations and providing all other items incidental to the Work included in this Specification

### **E15. INSTALLATION OF SILT FENCE**

#### E15.1 Description

E15.1.1 This Specification covers the erection of temporary silt fencing, which shall be installed and maintained at the locations shown on the drawings to control runoff and minimize the release of detrimental silt loading to watercourses.

E15.1.2 The scope of Work included in this specification is as follows:

- (a) Maintain the silt fencing in serviceable condition throughout the entire duration of activities at the Site where silt fencing is required, including final restoration and cleanup of the construction Site.
- (b) Remove the silt fencing and restore the area where the fencing was installed, without further disturbing the area and without releasing any deleterious substances to the adjacent watercourse.

**E15.2 Materials**

**E15.2.1 Fence Posts**

- (a) Fence posts shall be 100 mm diameter untreated wood posts or 50 mm diameter steel.

**E15.2.2 Filter Fabric**

- (a) Filter Fabric Shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

| <b>Property</b>             | <b>Test Method</b> | <b>Value</b>             |
|-----------------------------|--------------------|--------------------------|
| Grab Tensile Strength       | ASTM D 4632        | 0.55 kN                  |
| Grab Tensile Elongation     | ASTM D 4632        | 15%                      |
| Mullen Burst                | ASTM D 4786        | 2060 kPa                 |
| Puncture                    | ASTM D 4833        | 0.285 kN                 |
| Trapezoid Tear              | ASTM D 4533        | 0.285 kN                 |
| UV Resistance               | ASTM D 435         | 5 80 % @ 500 hrs         |
| Apparent Opening Size (AOS) | ASTM D 4751        | 0.60 mm                  |
| Flow Rate                   | ASTM D 4491        | 405 l/min/m <sup>2</sup> |

Acceptable Product: "Amoco 2130 Silt Fence Fabric" or approved equal in accordance with B6.

**E15.2.3 Wire Mesh**

- (a) Wire mesh shall be galvanized or plain metal with wire gauge = 3.0 mm, wire spacing @ 150 mm o/c

**E15.2.4 Fencing Material Fasteners**

- (a) Staples or wire ties of sufficient strength and spacing to withstand 500 N (100 lbf) pull test at any point on the wire mesh.

**E15.3 Construction Methods**

**E15.3.1 Ensure that no deleterious substances are discharged into the adjacent watercourse at any time during construction activities**

**E15.3.2 Silt Fence Installation**

- (a) Excavate 150 x 150 anchor trench along alignment of silt fence as indicated.
- (b) Install fence posts as indicated. Ensure that fence posts are firmly driven into undisturbed soil, or are completely and firmly backfilled if installed via auger methods. Attach wire mesh as support backing for silt fence filter fabric with fasteners. Attach silt fence 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 in anchor trench as shown.
- (c) Install and compact impermeable excavated materials into anchor trench and slope as indicated. Compact to 95% of maximum dry density (ASTM D-698).

**E15.3.3 Silt Fence Maintenance**

- (a) Inspect silt fence daily, prior to starting any other construction activities. If fence posts are found loose or not upright, repair in accordance with installation procedure. If silt fence is found to be loose or torn, repair or replace as necessary to comply with this Specification.

- (b) If silt deposition at the fence is 300 mm or more in depth, carefully remove and dispose of silt offsite without disturbing silt fence.

E15.3.4 Silt Fence Removal

- (a) The silt fence shall remain in place until new vegetation growth has established on the bank, as determined by the Contract Administrator.
- (b) Upon authorization of the Contract Administrator, remove all fence posts, wire mesh, fabric, and fasteners from Site.

E15.4 Method of Measurement

- (a) Installation of Silt Fence will be measured on a linear basis. The length to be paid shall be the total number of metres of Silt Fence installed, maintained and removed in accordance with this Specification, acceptable to the Contract Administrator.

E15.5 Basis of Payment

- (a) Installation of Silt Fence will be paid for at the Contract Unit Price for "Installation of Silt Fence", measured as specified herein, which price shall be payment in full for performing all operations and providing all other items incidental to the Work included in this Specification.

**E16. EXPANDED POLYSTYRENE GEOFOAM**

E16.1 General

- E16.1.1 This section includes all product design, labour, equipment and services necessary to complete the rigid expanded polystyrene (EPS) geofoam work in accordance with the Contract documents

E16.2 References

E16.2.1 American Society for Testing and Materials (ASTM)

- (a) ASTM D 1621-00 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- (b) ASTM C 578-95 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- (c) ASTM C 303-98 Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation

E16.2.2 Underwriters Laboratories of Canada (ULC)

- (a) CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Board and Pipe Covers

E16.3 System Description

- E16.3.1 Performance Requirements: Provide EPS geofoam designed, manufactured and installed to maintain stated performance criteria without defections, damage or failure.

E16.4 Submittals

E16.4.1 Product Data:

- (a) Submit manufacturer's printed design specifications, product design data and product literature indicating:
  - (i) Product performance criteria used to confirm capability to withstand specified design loads of 85.2kPa.
  - (ii) Meet AASHTO EPS 100 (ASTM C 578, IX)
  - (iii) Product transportation, storage, handling and installation requirements.

E16.4.2 Samples

- (a) Submit samples for verification of product performance criteria as follows:
  - (i) Submit 300 x 300 x 300 mm (12" x 12" x 12") sample of proposed material.

#### E16.4.3 Reports

- (a) Submit certificate of compliance for material properties from manufacturer for each 85m<sup>3</sup> of Product.
- (b) Provide proof of third party inspection certification program in place covering each product specified in this Section confirming compliance

#### E16.5 Delivery, Storage and Handling

- E16.5.1 Protect EPS geofoam material from prolonged exposure to sunlight (more than 1 week). Store under light colored tarpaulins. Secure geofoam blocks against movement from wind at the storage location.
- E16.5.2 Provide adequate protection of materials and works from damage by weather, traffic, fire and other causes.

#### E16.6 Materials

##### E16.6.1 EPS lightweight fill material:

- (a) Block or planar rigid polystyrene geofoam fill material as supplied by Plasti-Fab (or approved equal as accepted by the Contract Administrator in accordance with B6) providing minimum design compressive resistance to withstand design loads as specified on Contract Drawings.
- (b) Minimum geofoam compressive resistance properties to withstand design loads shall be determined in accordance with ASTM D 1621.

- E16.6.2 Timber Connectors: Specially fabricated connection plates using gang nail connector plates 53 x 137 mm as manufactured by Gang Nail Canada Inc. (or approved equal as accepted by the Contract Administrator in accordance with B6) placed back to back in pairs, offset 1/2 space and spot welded together prior to installation.

#### E16.7 Source Quality Control

- E16.7.1 Perform plant inspections and obtain representative product for compressive resistance tests in accordance with ASTM D1621. Testing to be conducted by a testing laboratory accredited by the Standards Council of Canada for testing of rigid foam plastic material and test reports submitted to Contract Administrator.

#### E16.8 Manufacturer's Instructions

- E16.9 Compliance: Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage, and installation instructions.

#### E16.10 Workmanship

- E16.10.1 Install EPS geofoam material after subgrade materials have been prepared.
- E16.10.2 Cut and trim EPS geofoam block neatly to fit spaces. Butt joints tightly, offset vertical joints. Geofoam blocks should be free from chips or broken edges. Use largest possible dimensions to reduce number of joints.
- E16.10.3 Offset both vertical and horizontal joints in multiple layer applications.
- E16.10.4 Do not backfill geofoam block until it has been inspected and approved by Contract Administrator.

#### E16.11 Examination

E16.12 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Contract Administrator. Commencement of Work means acceptance of existing conditions.

#### E16.13 Preparation

E16.13.1 Verify subgrade surface is free from surface water, frozen matter or projections and other foreign matter detrimental to performance.

E16.13.2 Remove excess debris from exposed surfaces.

E16.13.3 Prepare sand bedding as detailed in Drawings. The required smoothness of the sand bedding shall have no more than 10 mm over and 3 metre distance.

E16.13.4 Prohibit traffic on prepared areas until Work of this Section has been completed.

E16.13.5 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from Work of this Section.

#### E16.14 Installation

E16.14.1 Lay EPS geofoam fill material in position with staggered joints, as shown on plans.

E16.14.2 Finished grade tolerance for the geofoam layer is +/- 50 mm.

E16.14.3 Ensure the plane on which a given layer of blocks is placed is parallel to the longitudinal axis of the road alignment.

E16.14.4 Ensure a minimum of two layers of blocks are placed at all locations, unless directed by Contract Administrator.

E16.14.5 Ensure that within a given layer of blocks, the longitudinal axes of all blocks are parallel with each other.

E16.14.6 Ensure that within a given layer of blocks, the vertical joints between the adjacent ends of blocks within a given row of blocks are offset to the greatest extent practicable relative to blocks in adjacent rows.

E16.14.7 Ensure the longitudinal axes of blocks for layers above and/or below a given layer are perpendicular to the longitudinal axes of blocks within that given layer.

E16.14.8 Ensure the longitudinal axes of the uppermost layer of blocks are perpendicular to the longitudinal axis of the road alignment.

#### E16.15 Protection

E16.15.1 Place pavement structure material using appropriate equipment and methods to avoid damage to EPS geofoam fill.

E16.15.2 Provide adequate protection of Work from damage by weather, traffic, fire and other hazards during installation.

#### E16.16 Measurement and Payment

E16.16.1 Lightweight Expanded Polystyrene Fill will be measured and paid for on a volume basis. The volume to be paid shall be the total number of cubic metres of EPS geofoam fill supplied and installed, in accordance with this Specification, acceptable to the Contract Administrator.

E16.16.2 Sand bedding and cover shall be considered incidental to the cost for supply and installation of EPS geofoam fill.

### **E17. PILES - BRIDGE**

#### E17.1 Description

(a) The Specification shall cover the supply and installation of concrete piles.



- (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.

## E17.2 Materials

### E17.2.1 General

- (a) Refer to Structural (S) Drawings for details.

## E17.3 Construction Methods

### E17.3.1 Cast-in-Place Piles

- (a) The Contractor shall investigate the site conditions, available soil logs and the drawings to determine the best method of installing the piles. The method of installation shall be the responsibility of the Contractor.
- (b) The Contractor shall satisfy the Contract Administrator that his proposed procedures are in accordance with the best practice and will result in piles being stalled as shown on the drawings.

### E17.3.2 Layout

- (a) Piles shall be located as shown on the drawings. A qualified Surveyor shall establish a bench mark at readily accessible locations for reference in setting piles elevations.

### E17.3.3 Installation

- (a) Piles shall be drilled the size and depth indicated on the drawings. Excavated soil (resulting from the drilling operation) shall be removed from around the pile holes to ensure that it will not fall into the holes before or during concrete placement.
- (b) Reinforcement and concrete shall be placed as soon as possible after drilling. Clean, dry holes may be left open for up to 2 hours. Under no circumstances are piles to be left overnight prior to filling with concrete.
- (c) Concrete may be placed by the free fall method providing it is directed vertically on the centre line of the shaft and does not hit the sides of the shaft or reinforcement cage. IF the diameter of the reinforcement cage is too small to allow free fall, an elephant truck shall be used.
- (d) Sonotube forming or equivalent, as required shall be used to extend pile shafts and/or to form a neat pile top.
- (e) The Contract Administrator shall be notified of the readiness of the piles for inspection. Piles will be inspected before reinforcing steel is placed.
- (f) Piles shall not be more than 50 mm out of position laterally at the top and not more than 2% out of plumb.
- (g) Vibrate top 4600 of Concrete in all piles.
- (h) Sleening where required shall be included as incidental to piling unit cost.

#### E17.4 Material

- (a) Concrete for piles shall be in accordance with Class S-1 exposure.
  - (i) 35 MPa 28 day compressive
  - (ii) Type HS cement
  - (iii) 0.40 water/cement ratio
  - (iv) 20 mm Max. Agg. Size
  - (v) 4 to 7% Air content

#### E17.5 Quality Control

##### E17.5.1 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 the final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

#### E17.6 Method of Measurement

- (a) No measurement will be made for these works.

#### E17.7 Basis of Payment

- (a) Concrete piles shall be paid for within the Contract Unit Price for All Work, measured as specified herein, 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.

### **E18. STRUCTURAL CONCRETE - BRIDGE**

#### E18.1 Description

- (a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

#### E18.2 Scope of Work

- (a) Supplying and placing structural concrete for abutments and wingwalls;
- (b) Supplying and placing structural concrete for deck slab and curbs; and
- (c) Supplying and placing structural concrete for approach slabs.

#### E18.3 Submittals

##### E18.3.1 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 to CSA A23.1-04 Clause 4.3.2.3.2.
- (e) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

#### E18.3.2 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 (Ri) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 15, Fibre Reinforced Structures, Clause 16.6.
  - (iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.
- (b) Aggregates
  - (i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least 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.

#### E18.3.3 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.

#### E18.3.4 Temporary False Work, Formwork and Shoring Works

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.
- (b) Design Requirements
  - (i) The Contractor shall design false work, formwork and shoring for the new Bridge deck slab overhangs to be released prior to the placement of the High Performance Concrete (HPC) deck overlay and the sidewalk slab. The formwork shall not extend beneath the underside of the existing deck.



- (a) Plans for anchoring support rails shall be submitted to the Contract Administrator for review and acceptance at least ten (10) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator's written acceptance must be received by the Contractor prior to the installation of any anchorage devices.

**E18.4 Materials**

**E18.4.1 General**

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

**E18.4.2 Handling and Storage of Materials**

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

**E18.4.3 Concrete**

- (a) Concrete materials susceptible to frost damage shall be protected from freezing.
- (b) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table E23.1.

| <b>TABLE E23.1<br/>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>Special Requirements</b>                  | <b>Post Residual Cracking Index</b> |
| <b>Type 1</b>   | <b>Abutments and Wingwalls</b>             | <b>35 @ 28 Days</b>                       | <b>C-1</b>               | <b>1</b>                    | <b>20 mm</b>              | <b>-</b>                                     | <b>-</b>                            |
| <b>Type 2</b>   | <b>Deck Slab, Curbs and Approach Slabs</b> | <b>35 @ 28 Days</b>                       | <b>C-1</b>               | <b>1</b>                    | <b>20 mm</b>              | <b>Corrosion Inhibitor, Synthetic Fibres</b> | <b>0.15</b>                         |

**E18.4.4 Aggregates**

**(a) General**

- (i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.
- (ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 is required.

- (iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.
- (a) Fine Aggregate
- (iv) Fine aggregate shall meet the grading requirements of CSA A23.1-04, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.
- (v) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12.
- (a) Coarse Aggregate - Standard
- (vi) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-04, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.
- (vii) 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.
- (viii) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
- (ix) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12, for concrete exposed to freezing and thawing.

#### E18.4.5 Admixtures

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

#### E18.4.6 Cementitious Materials

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

#### E18.4.7 Water

- (a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall

conform to the requirements of CSA A23.1-04 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E18.4.8 Corrosion Inhibitor

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

E18.4.9 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 the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6 except the post-cracking residual strength index (R<sub>i</sub>) shall be determined in accordance with ASTM C1609.

E18.4.10 Formwork

- (a) Formwork materials shall conform to CSA Standard A23.1-04, 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 CSA Standard O121-M1978. Approved Manufacturers are "Evans" and "C-Z."
- (d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.
- (h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.
- (i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E18.4.11 Form Coating

- (a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal as accepted by the Contract Administrator, in accordance with B6.

E18.4.12 Permeable Formwork Liner

E18.4.13 Curing Compound

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



E18.4.14 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 B6.

E18.4.15 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 B6.

E18.4.16 Epoxy Grout

- (a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B6.

E18.4.17 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 B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E18.4.18 Flexible Joint Sealant

- (a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with B6.

E18.4.19 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 Standard D1751-99 or equal as accepted by the Contract Administrator, in accordance with B6.

E18.4.20 Precompressed Foam Joint Filler

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

E18.4.21 Low Density Styrofoam

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

E18.4.22 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%.

E18.4.23 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, Elstro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B6.

- (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., Elstro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B6.

#### E18.4.24 Miscellaneous Materials

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

#### E18.4.25 Benchmark Plugs

- (a) Benchmark plugs shall be supplied by the City. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be determined by the Contract Administrator.

### E18.5 Equipment

#### E18.5.1 General

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

#### E18.5.2 Vibrators

- (a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.
- (b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel, such as in locations that the existing deck reinforcing is exposed.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

#### E18.5.3 Placing and Finishing Equipment for Bridge Deck Concrete

- (a) Placing Equipment
  - (i) Adjacent exposed deck reinforcing steel shall be adequately protected during concrete placement.
- (b) Screed for Deck Slab Concrete
  - (i) The Contractor may choose to use a mechanical or non-mechanical screed to strike the surface of the deck slab concrete.
  - (ii) Screed rails are required and shall be sufficient in number and length to ensure that the concrete cover is maintained and the finished elevation of the deck slab concrete meets the design elevations.
  - (iii) Screed guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A

hold-down device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

- (iv) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.
- (v) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.
- (vi) Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.
- (vii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).
- (viii) The supply, setup, operation, and takedown of the screed for deck slab concrete shall be considered incidental to the placement of the deck slab concrete. No separate measurement or payment shall be made for this Work.

## E18.6 Construction Methods

### E18.6.1 General

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

### E18.6.2 Temporary False Work, Formwork, and Shoring

- (a) Construction Requirements
  - (i) The Contractor shall construct false work, formwork and shoring for the new deck slab concrete overhangs 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) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
  - (vii) 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.
  - (viii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
- (b) Form panels shall be constructed so that the contact edges are kept flush and aligned.
- (c) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.
- (d) 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.

- (e) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
- (f) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.
- (g) 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 48 hours for the Contract Administrator to judge the type of surface produced.
- (h) 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.

#### E18.6.3 Concrete Construction Joints

- (a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.
- (b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.
- (c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.

#### E18.6.4 Bridge Deck Screeds

- (a) Setting Deck Screeds
  - (i) The Contractor shall adjust screeds to maintain uniform slab thickness. Adjust screed heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases shall be permitted to be drilled and grouted into existing concrete and shall be adjustable to achieve the required elevations.
  - (ii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

#### E18.6.5 Benchmarks

- (a) The Contractor shall install benchmark plugs supplied by the Contract Administrator at such locations on the structure as may be directed by the Contract Administrator.

#### E18.6.6 Structure Identification Date

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

#### E18.6.7 Damp Proofing

- (a) Application of Dampproofing

- (i) Brush or spray primer on all surfaces, brushing into all corners. Apply two (2) coats of dampproofing allowing the first coat to dry before applying the second coat. Minimum application rate per coat shall be 0.6 L/m<sup>2</sup>.
- (ii) After application of the second coat, dampproofed areas shall be allowed to dry a minimum of 48 hours prior to backfilling.

E18.6.8 Approach Slabs Works

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

E18.6.9 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1-04, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
  - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.
  - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.
  - (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
  - (iv) Unless otherwise noted in Table E23.1, "Requirements for Hardened Concrete", no retarders shall be used.
  - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-04 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.
  - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Contract Administrator 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.

## E18.6.10 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 deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m<sup>2</sup>/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.
- (ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.
- (iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
- (iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
- (v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
- (vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (xi) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.
- (xii) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job site during all placing operations.
- (xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

- (xiv) Before any concrete is placed for the approach slabs, or Bridge deck 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.

#### E18.6.11 Finishing of Concrete Surfaces

- (a) Finishing Operations for Unformed Surfaces
  - (i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.
- (b) Type 1 Finish – Exposed Formed Surfaces
  - (i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes, but excluding soffit surfaces where an architectural form finish is specified.
  - (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.
  - (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
  - (iv) The surfaces shall be patched as specified in this Specification.
- (c) Type 2 Finish – 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.

#### E18.6.12 General Curing Requirements

- (a) Refer to E18.6.15 for cold weather curing requirements and E18.6.16 of this Specification for hot weather curing requirements.
- (b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.
- (c) 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.
- (d) Curing compound shall be applied at the rate required by ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.
- (e) 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.
- (f) 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.

- (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.
- (h) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.
- (i) 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.
- (j) The median slab shall be moist cured in accordance with E18.6.12(c).
- (k) After the finishing and brooming is completed, the surface shall be sprayed with an initial coating of curing compound. As soon as initial set has occurred, the slab surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

#### E18.6.13 Form Removal

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.
- (b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.
- (c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for deck extensions shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads. Bridge deck overhang forms shall be loosened and may be removed prior to placement of the HPC overlay. Stripping of these forms shall not be permitted until a concrete strength of 28 MPa has been achieved by the deck slab concrete and the concrete Bridge traffic barriers.
- (d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

#### E18.6.14 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.
- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within 24 hours of formwork removal.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract



Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

- (f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.
- (g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

#### E18.6.15 Cold Weather Concreting

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

#### E18.6.16 Hot Weather Concreting

##### (a) General

- (i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.
- (ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.
- (iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.
- (iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.
- (v) Sun shades and wind breaks shall be used as required during placing and finishing.
- (vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".
- (vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.
- (viii) Hot weather curing shall follow immediately after the finishing operation.

##### (b) Hot-Weather Curing

- (i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.
- (ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

##### (c) Job Preparation

- (i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

(d) Concrete Temperature

- (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E23.2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

| <b>TABLE E23.2: ACCEPTABLE CONCRETE TEMPERATURES</b> |                        |                |
|--|------------------------|----------------|
| <b>THICKNESS OF SECTION, M</b>                       | <b>TEMPERATURES °C</b> |                |
|  | <b>MINIMUM</b>         | <b>MAXIMUM</b> |
| Less than:   |                        |                |
| 1  | 10                     | 27             |
| 1.2  | 5                      | 25             |

E18.6.17 Cleanup

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

E18.7 Concrete Quality

E18.7.1 Inspection

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

E18.7.2 Access

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

E18.7.3 Materials

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall conform to CSA Standard A23.1-04.
- (c) All testing of materials shall conform to CSA Standard A23.2-04.
- (d) All materials shall be submitted to the Contract Administrator for acceptance at least 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.

E18.7.4 Quality Assurance and Quality Control

- (a) The Contract Administrator shall be afforded full access for the inspection and control and assurance testing of concrete and constituent materials, both at the site of Work and at any plant used for the production of concrete, to determine whether the concrete is being supplied in accordance with this Specification.
- (b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.
- (c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.
- (d) Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.
- (f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-04. An outline of the quality tests is indicated below.

#### E18.7.5 Concrete Testing

- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-04, "Slump of Concrete". If the measured slump falls outside the limits in E18.3.1 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
- (b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E18.3.1 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.
- (c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-04, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
- (d) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202.
- (e) Testing for post-cracking residual strength index of FRC shall be tested as follows. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399-04 without the steel plate. The average of the peak loads is the cracking load of the concrete ( $P_{cr}$ ), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete ( $P_{pcr}$ ). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Specimens shall be sampled in accordance with E18.7.5(g).
- (f) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".

- (g) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-04, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (h) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (i) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table E23.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

#### E18.7.6 Corrective Action

- (a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

#### E18.8 Measurement and Payment

##### E18.8.1 Structural Concrete

- (a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.
- (b) Items of Work:
  - (i) Supply and Place Structural Concrete:
    - (i) Deck Extension and Wingwalls;
    - (ii) Median and Barriers;
    - (iii) Deck Replacement;
    - (iv) Approach Slabs; and
    - (v) Sleeper Slab.
- (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.

## **E19. STRUCTURAL STEEL - BRIDGES**

### DESCRIPTION

E19.1 This specification covers the supply and installation of structural steel for bridges.

### SPECIFICATIONS AND DRAWINGS

E19.2 Referenced Standard Construction Specifications and Standard Details

- (a) Canadian Standards Association (CSA International)
  - (i) CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
  - (ii) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles
  - (iii) CAN/CSA S6, Canadian Highway Bridge Design Code
  - (iv) CAN/CSA S16, Limit States Design of Steel Structures
  - (v) CSA S269.1, Falsework for Construction Purposes
  - (vi) CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
  - (vii) CSA W59, Welded Steel Construction, (Metal Arc Welding) (Metric version)
- (b) American Society for Testing and Materials International, (ASTM)
  - (i) ASTM A325M, Specification for High-Strength Bolts for Structural Steel Joints (Metric Version)
  - (ii) ASTM A490M, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints

### SHOP DRAWINGS

E19.3 This specification covers the supply and installation of detectable warning surface tiles in sidewalk ramps and multi-use path ramps.

- (a) Each drawing submitted to bear signature and stamp of qualified professional engineer registered or licensed in province of Manitoba, Canada.
- (b) Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.
- (c) Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
- (d) Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel.
- (e) Falsework drawings submitted to bear signature and stamp of qualified professional engineer registered or licensed in province of Manitoba, Canada.

### DELIVERY, STORAGE AND HANDLING

E19.4 Provide protective blocking for lifting, transportation and storing

- (a) Exercise care during fabrication, transportation and erection so as not to damage girders and beams.
- (b) Do not notch edges of members.
- (c) Do not cause excessive stresses.

E19.5 Ensure that no portion of steel comes into contact with ground.

### MATERIALS

E19.6 Structural Steel:

- (a) to CSA G40.20/G40.21, grade and types as indicated.

- (b) Leave atmospheric corrosive resistant steel and connections material in unpainted, include bolts, nuts, washers and weld deposits of compatible weathering characteristics.

E19.7 High strength bolts, nuts and washers: to ASTM A325M. Bolts to ASTM A490M approved by Contract Administrator.

E19.8 Anchor bolts, washers and nuts: to CSA G40.20/G40.21, grade 300W galvanized.

E19.9 Bearings: elastomer bearing pads of neoprene.

E19.10 Welding electrodes: to CSA W48 series.

E19.11 Stud shear connectors: to CSA W59, Clause 5.5.6 and Appendix H.

E19.12 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 600 g/m<sup>2</sup>

#### SOURCE QUALITY CONTROL

E19.13 Provide Contract Administrator prior to fabrication, with <sup>^</sup>[two] copies of steel producer certificates, in accordance with CSA G40.20/G40.21.

E19.14 Provide Contract Administrator with two copies of certified test reports for Charpy V-notch tests.

E19.15 Provide suitable facilities and cooperate with Contract Administrator in carrying out inspection and tests required.

#### ERECTION

E19.16 Clean steel surfaces to Contract Administrator's approval when staining or defacing occurs.

E19.17 Verify location of substructure units, elevations of bearing seats and location of anchor bolts before erection of structural steel; report discrepancies to Contract Administrator.

E19.18 Do not disturb river banks or embankments without prior written permission of Contract Administrator.

E19.19 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.

- (a) Enlarge holes if necessary by reaming only after written approval is obtained from Contract Administrator.

- (b) Reamed holes not to exceed size of bolt used by more than 2 mm.

E19.20 Fabricate and install bearings as indicated.

E19.21 Place anchor bolts to elevations and locations indicated.

- (a) Protect holes against entry of water and foreign material.
- (b) Provide heating and protection as directed by Contract Administrator and completely fill space around anchor bolts with grout.

#### INSTALLATION

E19.22 Do falsework in accordance with CSA S269.1, except where specified otherwise.

E19.23 Do fabrication and erection of structural steel in accordance with CAN/CSA-S6, Design of Highway Bridges

E19.24 Do welding in accordance with CSA W59, except where specified otherwise.

- (a) For CSA G40.20/G40.21, grade 350A steel, deposited weld metal to have Charpy V-Notch value not lower than that of steel.

- (b) Do welding in shop unless otherwise permitted by Contract Administrator
- (c) Weld only at locations indicated.

E19.25 High strength bolting: in accordance with CAN/CSA S16. Use 'turn-of-nut' tightening method.

E19.26 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.

E19.27 Allowable tolerance for bolt holes:

- (a) Matching holes for bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
- (b) Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Contract Administrator.
- (c) Centre-to-centre distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
- (d) Centre-to-centre distance between any two groups of holes to vary not more than following:

| Centre-to-Centre Distance (m) | Tolerance (+/- mm) |
|-------------------------------|--------------------|
| Less than 10                  | 1                  |
| 10 to 20                      | 2                  |
| 20 to 30                      | 3                  |

- (e) Correct mispunched or misdrilled members only as directed by Contract Administrator.

E19.28 Span length tolerances:

- (a) Girders and beams: plus or minus 6 mm
- (b) Centre-to-centre of bearing stiffeners and bearing plates: plus or minus 3 mm

E19.29 Girder support requirements:

- (a) Support top and bottom flanges of ends of girders and intermediate bearing locations of continuous girders parallel to each other at 90 degrees to girder web.
- (b) Install flat and smooth except as otherwise indicated.
- (c) Install bearing stiffeners after girder support requirements have been met.
- (d) Do not machine or grind flanges of girders to correct irregularities unless permitted by Contract Administrator.

E19.30 Camber:

- (a) Camber tolerances for plate girders to be in accordance with CSA W59.
- (b) Record measurements of camber of each girder, at points indicated.
- (c) Fabricate field splices to conform to required camber.
- (d) Submit diagram to Contract Administrator showing camber for each girder fabricated.
- (e) Advise Contract Administrator immediately when camber of fabricated girder is not within specified tolerances.
- (f) Submit proposal for corrective measures.
- (g) Do not undertake remedial measures until proposal has been approved by Contract Administrator.

E19.31 Field splices: to approval of Contract Administrator

E19.32 Mark members in accordance with CSA G40.20/G40.21.

- (a) Do not use die stamping.
- (b) Place marking at locations not visible from exterior after erection when steel is to be left in unpainted condition.

E19.33 Maintain protection of concrete for 7 days after completion of steel erection.

E19.34 Remove waterproof covers and drains and holding structures when steel erection complete

#### MEASUREMENT AND PAYMENT

E19.35 Structural Steel will be measured on a lump sum basis and paid for at the Contract Unit Price for "Structural Steel".

E19.36 Bearing pads will be measured on a lump sum basis and paid for at the Contract Unit Price for "Bearing Pads".

E19.37 Expansion Joints will be measured on a lump sum basis and paid for at the Contract Unit Price for "Expansion Joints".

### **E20. RESET AND RAISE EXISTING FENCE**

#### DESCRIPTION

E20.1 General

E20.1.1 This specification covers the removal and reinstallation of existing fencing along the west side of Sherwin Road on the headwall crossing Omand's Creek.

#### CONSTRUCTION METHODS

E20.2 The Contractor shall remove entire length of existing fencing prior to construction of new concrete curbing on existing headwall.

E20.3 The Contractor shall reset fencing in new curbing on existing headwall.

#### MEASUREMENT AND PAYMENT

E20.4 Removal and resetting of existing fencing will be measured on a length basis and paid for at the Contract Unit Price per metre for "Reset and Raise Existing Fence". The number to be paid for will be the total length of fence removed and reset in accordance with this specification and accepted by the Contract Administrator

### **E21. CONCRETE REINFORCEMENT - BRIDGE**

E21.1 Description

- (a) This Specification shall cover the supply, fabrication, anchoring, and placement of the following reinforcing bars for structural concrete:
  - (i) MMFX steel reinforcing bars for approach slabs, curbs, deck slab, abutments and wing walls
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E21.2 Submittals

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



- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor, and the qualifications of Operators, and the mill certificates.
- (c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed materials to be used.

### E21.3 Materials

#### E21.3.1 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 shall be handled in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1-00, Storage of Materials, except as otherwise specified herein.

#### E21.3.2 Galvanized Reinforcing Steel

- (a) Shop Applied
  - (i) The galvanizing shall be shop applied and strictly in accordance with ASTM A767M-05 to a retention equal to a Class II level (610 gm/rn<sup>2</sup>), except as otherwise specified herein.
  - (ii) Preclean reinforcing steel using acceptable methods to produce an acceptable surface for quality hot-dip galvanizing.
  - (iii) Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
  - (iv) The surface finish shall be continuous, adherent, as smooth and evenly distributed as possible, and free from any defect detrimental to the stated end use of the coated article.
  - (v) Coating adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
  - (vi) Sheared ends of bars shall be coated with a zinc-rich formulation before rusting occurs and before shipment to the job site.

#### E21.3.3 Bar Accessories

- (a) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (16 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. Bar accessories for Galvanized steel reinforcing bars shall be of the types suitable for each type of reinforcement and 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.

#### E21.3.4 Galvanizing Touch-Up and Field-Applied Galvanizing

- (a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metalizing, or filed welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-01 (2006) for "Repair of Damaged Hot-Dip Galvanized Coatings."
- (b) Approved products are:
  - (i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and
  - (ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

## **E22. HANDRAILS - BRIDGE**

### **E22.1 Description**

- (a) This Specification shall cover the supply and installation of aluminum handrail.
- (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.

### **E22.2 Materials**

- (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 subject to inspection and acceptance by the Contract Administrator.
- (c) Aluminum handrail shall be supplied conforming to the requirements of the Contract Drawings
- (d) The handrail shall conform to the requirements of ASTM B221M-83 Alloy 6061-T6 or Alloy 6351-T6 for extrusions, sheet, and plate. Aluminum Filler Alloy for welded construction shall be one of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654. Welded construction shall conform to the requirements of CSA Standard S244-1969 and CSA Standard W47.2- M1987.

### **E22.3 Construction Methods**

- (a) The installation of aluminum handrail shall conform to the requirements of the Contract Drawings, to the satisfaction of the Contract Administrator.
- (b) Welded construction shall conform to the requirements of CSA Standards W592-M91 "Welded Aluminum Construction" and W47.2-M1987, "Certification of Companies for Fusion Welding of Aluminum."
- (c) In the event of damage to any materials, the Contractor shall immediately notify the Contract Administrator and make all necessary repairs or replacements, at his own expense, to the satisfaction of the Contract Administrator. In no case shall the Contractor install a damaged component on the barrier.

### **E22.4 Measurement and Payment**

- (a) The supply and installation of aluminum handrail shall be paid for at the Contract Lump Sum Price for "Handrails".
- (b) The supply of all hardware required for installation of the Aluminum Handrail shall be considered incidental to the installation of the handrail and no additional measurement or payment shall be made.