THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 133-2010

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, April 13, 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 AND EXISTING DRAWINGS

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

B3.2 Available existing drawings may be viewed at the office of the Contract Administrator. The accuracy of these drawings is not guaranteed and the Bidder must interpret based on site investigation.

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

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in 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, and in accordance with B7.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

B7. BID COMPONENTS

B7.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Bid Security:

(i) Form G1: Bid Bond and Agreement to Bond, or

(ii) Form G2: Irrevocable Standby Letter of Credit and Undertaking, or a certified cheque or draft.

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

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

B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder’s Bid.

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

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

B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).

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

B7.8 Bids shall be submitted to:

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

B8. BID

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

B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;

(b) if the Bidder is a partnership, the full name of the partnership shall be inserted;

(c) if the Bidder is a corporation, the full name of the corporation shall be inserted;

(d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

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

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

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

(a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;

(b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;

(c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;

(d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

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

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

B9. PRICES

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

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

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

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

B9.4 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 (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 (c), it will be deposited and retained by the City as the performance security and no further submission is required.

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

B11.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

B12.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.

B12.1.1 Bidders or their representatives may attend.

B12.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B12.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B12.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B13. IRREVOCABLE BID

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

B13.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as

herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B14. WITHDRAWAL OF BIDS

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

B14.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

B14.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:

(a) retain the Bid until after the Submission Deadline has elapsed;

(b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and

(c) if the notice has been given by any one of the persons specified in B14.1.3(b), declare the Bid withdrawn.

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

B15. EVALUATION OF BIDS

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

(a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation there from (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B10 (pass/fail);

(c) Total Bid Price;

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

B15.2 Further to (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 (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 (c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.

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

B15.4.2 Further to B15.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

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

B16. AWARD OF CONTRACT

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

B16.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B16.2.1 Without limiting the generality of B16.2, the City will have no obligation to award a Contract where:

(a) the prices exceed the available City funds for the Work;

(b) the prices are materially in excess of the prices received for similar work in the past;

(c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;

(d) only one Bid is received; or

(e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B15.

B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The General Conditions for Construction (Revision 2006 12 15) are applicable to the Work of the Contract.

C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “C” designates a section, clause or subclause in the General Conditions for Construction.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of Bridge Rehabilitation and the Associated Roadwork.

(a) The Bridge Works to be done under the Contract shall consist of:
  (i) Concrete removals.
  (ii) Bearing replacement at pier columns.
  (iii) Installation of Cathodic protection at the deck and pier columns.
  (iv) Supply and placement of concrete.
  (v) Supply and placement of reinforcing for concrete.
  (vi) MSE retaining wall.
  (vii) Traffic railing.
  (viii) Expansion joints.

(b) The Roadwork to be done under the Contract shall consist of:
  (i) Pavement Reconstruction.
  (ii) Eastbound and westbound approach ramps to the structure from Jubilee Avenue to the east end of the structure.
  (iii) Eastbound and westbound approach ramps to the structure from Pembina Highway to the west end of the structure.
  (iv) Asphalt resurfacing.
  (v) Eastbound and westbound lanes of Jubilee Avenue from the east limit of the new deceleration lane to Pembina Highway.

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

<u>I Bridge Works</u>

(a) Remove existing median and scan post-tensioning tendons in pier regions.

(b) Replace all pot bearings at pier columns.

(c) Install pier corrosion protection for all six pier columns after spalls and delaminations are repaired.

(d) Remove existing deck surface using hydro demolition methods.

(e) Remove existing approach slabs.

(f) Remove existing curbs and concrete barriers.

(g) Remove top ±40 mm at deck under existing curbs and concrete barriers.

(h) Install deck cathodic protection and monitoring system.

(i) Construct new concrete barriers.

(j) Reconstruct concrete deck surface plus modify ends at deck to make semi-integral abutments (deck extensions).

(k) Construct reinforced concrete median.

(l) Construct MSE retaining wall.

(m) Construct approach slabs.

(n) Place high performance concrete overlay.

(o) Construct reinforced concrete pavement with expansion joints and concrete barriers.

II – Roadworks

(a) Removal of existing pavement.

(b) Milling of existing asphalt overlay.

(c) Excavation for pavement, MSE wall and grading beyond the MSE wall.

(d) Installation of subdrains.

(e) Compaction of existing subgrade.

(f) Installation of catchbasins and connection pipe.

(g) Placement of sub-base and base course materials.

(h) Placement of suitable site fill material.

(i) Adjustment of existing manholes/catchbasins.

(j) Abandonment and removal of existing catchbasins and drainage inlets.

(k) Construction of 230 mm plain dowelled concrete pavement utilizing slip form paving equipment.

(l) Construction of 230 mm plain dowelled concrete pavement utilizing hand placement methods.

(m) Construction of 250 mm reinforced concrete pavement.

(n) Construction of 180 mm height, 750 mm width monolithic concrete splash strip utilizing slip form paving equipment.

(o) Construction of 180 mm height, 750 mm wide monolithic concrete splash strip utilizing hand placement methods.

(p) Construction of 150 mm height, 750 wide dowelled splash strip utilizing slip form paving equipment.

(q) Construction of 180 mm height separate concrete barrier curb.

(r) Construction of 150 mm height dowelled barrier curb.

(s) Construction of monolithic concrete safety median, varying width.

(t) Construction of monolithic concrete median slab.

(u) Construction of 100 mm concrete sidewalk and median slab.

(v) Placement of new asphaltic concrete overlay (75 mm average thickness).

(w) Removal of existing sprinkler lines and installation of new sections of sprinkler line.

(x) Removal, salvage and re-installation of aluminum balanced barrier rail and posts.

(y) Removal and salvage of existing pole mount sign structure.

(z) Relocation of existing cantilever overhead sign structure and construction of new concrete pile foundation.

(aa) Relocation of pre-cast frangible planters, construction of planter foundation and supply and placement of topsoil for planters.

(bb) Boulevard restoration and site cleanup.

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is AECOM, represented by:

Barry Biswanger, P.Eng.

Senior Structural Engineer, Transportation
99 Commerce Drive, Winnipeg MB R3P 0Y7

Telephone No. (204) 477-5381
Facsimile No. (204) 284-2040

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

D4. CONTRACTOR'S SUPERVISOR

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

D5. NOTICES

D5.1 Except as provided for in 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 should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D9. 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 and the Contract Administrator added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

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

(c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.

D9.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

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 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

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 least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

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 least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13. DETAILED WORK SCHEDULE

D13.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13.2 The detailed work schedule shall consist of the following:

(a) a critical path method (C.P.M.) schedule for the Work;

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

(c) a daily manpower schedule for the Work;

all acceptable to the Contract Administrator.

D13.3 Further to D13.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

(a) Pedestrian and traffic control installation and removal;

(b) Installation of temporary catch platforms;

(c) Existing bridge removals;

(d) Forming for deck and deck extensions;

(e) Bearing replacement and pier cathodic protection;

(f) Deck cathodic protection, reinforcing and concrete placement;

(g) Concrete barriers and median curb slab;

(h) Approach slabs for roadway;

(i) Deck slab overlay;

(j) MSE wall;

(k) Excavation and pavement removal;

(l) Sub-base and base course construction;

(m) Concrete pavement construction;

(n) Asphalt resurfacing and related work on Jubilee Avenue; and

(o) Landscaping.

D13.4 Further to D13.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D13.5 Further to D13.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

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 Safe Work Plan specified in D8;

(iv) evidence of the insurance specified in D9;

(v) the performance security specified in D10;

(vi) the Subcontractor list specified in D11;

(vii) the equipment list specified in D12; and

(viii) the detailed work schedule specified in D13.

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

D14.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D14.4 The City intends to award this Contract by April 27, 2010.

D14.4.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D15. CRITICAL STAGES

D15.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Stage I Roadwork by July 16, 2010 substantially completed such that the entire Stage I Roadwork is ready to open to traffic.

(b) Stage II Roadwork and Bridgework by September 6, 2010 substantially completed.

D15.2 When the Contractor considers the Work associated with Stage I Roadwork to be completed the Contractor shall arrange, attend and assist in the inspection of the Work with the contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work

noted during that inspection shall be remedied by the contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D15.3 The Work shall be divided into two stages. Stages are further subdivided into major items of Work.

(a) **Stage I** – Removal of existing ramp pavement west of the structure, construction of MSE Wall and ramp pavement and related Works west of the structure. Installation of new catch basins and sewer service pipe as applicable for the Overpass rehabilitation work.

(i) Remove existing ramp pavement west of the structure;
(ii) Excavate for construction of MSE wall'
(iii) Construct MSE wall and place backfill material for the wall'
(iv) Install new catchbasins and related sewer service pipe connections to existing sewers;
(v) Excavate and place subbase and base course material for new concrete pavement;
(vi) Construct new concrete pavement, splash strip, concrete medians and traffic barrier;
(vii) Place suitable site fill material and complete boulevard restoration; and
(viii) Bridge rehabilitation works, ongoing.

(b) **Stage 2** – Removal of existing ramp pavement east of the structure and construction of new ramp pavement to Jubilee Avenue including geometric modifications in the Jubilee Avenue intersection. Installation of new catchbasins and sewer service pipe as applicable for the Overpass rehabilitation work.

(i) Remove existing ramp pavement east of the structure and on Jubilee Avenue
(ii) Install new catchbasins and related pipe connections to existing sewers;
(iii) Excavate and place subbase and base course material for new concrete pavement;
(iv) Construct new concrete pavement, splash strip, concrete medians and traffic barrier;
(v) Mill existing asphalt overlay on Jubilee Avenue;
(vi) Complete concrete slab replacements and concrete median and splash strip construction;
(vii) Place new asphaltic concrete overlay within project limits;
(viii) Place suitable site fill material and complete boulevard restoration; and
(ix) Bridge rehabilitation works, completed.

D15.4 The Contractor is advised that no work shall take place in the lanes of Jubilee Avenue prior to June 21, 2010, the Monday following the Manitoba Marathon.

D15.5 Immediately following the completion of the concrete pavement works of each stage, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other contractors.

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 Sundays, Statutory Holidays and or Civic Holidays.

D16.2 In accordance with the Manual of Temporary Traffic Control, Sections 2.03, 2.04, 2.05 and 2.06, should the Traffic Management Brand of the Public Works Department require that work on Regional Streets be carried out at night or on Sundays or on public holidays, where permitted by the City of Winnipeg Police Department, or that work be restricted or suspended during peak traffic hours, no additional compensation will be considered to meet these requirements.

D17. WORK BY OTHERS

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

(a) Manitoba Hydro Lighting Division, removal and re-installation of existing roadway light standards and high mast lights and related wiring and foundations;

(b) Manitoba Hydro Gas Division, adjustment of existing gas valves on large diameter and high pressure gas mains, safety watch during work in the vicinity of large diameter and high pressure gas mains.

(c) City of Winnipeg Traffic Signals, reconstruction of the traffic signals at the intersection of the new approach ramps to the Jubilee Overpass and Jubilee Avenue.

(d) Jubilee Avenue Active Transportation Work on Jubilee Avenue, the limits which are adjacent to the overpass project will be the south sidewalk of Jubilee Avenue from the east limit of resurfacing work to Cockburn Street. This work is expected to commence prior to and run concurrently with work on the overpass.

(e) Watermain renewal on Jubilee Avenue in the south gutter lane from approximately 100 m east of Pembina Highway to Merriam Boulevard in the east gutter lane of Pembina Highway. Work is expected to commence June 21, 2010 and is anticipated to be complete by July 16, 2919. Coordination of lane closures in the south gutter of Jubilee Avenue will be required between the Jubilee Avenue Overpass contractor and Jubilee Avenue Watermain Renewal Contractor.

D17.2 The Contract Administrator will attempt to arrange and coordinate Work to be performed by others so that such Work does not interfere with the Work and Schedule of the Contractor. Where Work by others interferes, as determined by the Contract Administrator, with the Contractor's planned Work, the Contractor shall modify his plans and do other Work. Unless the Contract Administrator determines that there was no opportunity for the Contractor to do a similar amount of Work, no consideration will be made to extending the Contract time.

D18. SUBSTANTIAL PERFORMANCE

D18.1 The Contractor shall achieve Substantial Performance by September 6, 2010.

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 reinspected.

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 by September 17, 2010.

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 reinspected.

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 Three Thousand dollars ($3,000) 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) Sod maintenance as specified in CW 3510-R9;

(b) Reflective crack maintenance during two year maintenance. Warranty as specified in CW 3250-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 at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

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).

D24. SHOP DRAWINGS

D24.1 Further to General Condition C:6.10, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract or as may reasonably be required by the Contract Administrator.

D24.2 The Contractor shall review all Shop Drawings prior to submitting same to the Contract Administrator. By this review, the Contractor represents that he has determined and verified all

field measurements, field construction criteria, materials, catalogue numbers and similar data, and that he has checked and coordinated each Shop Drawing with the requirements for the Work and of the Contract. The Contractor's review of each Shop Drawing shall be certified by stamp, date and signature in the manner stipulated by the Contract Administrator.

D24.3 The Contractor shall promptly submit Shop Drawings to the Contract Administrator in an orderly sequence to prevent delay in the Work or in the Work of other contractors. At the time of submission, the Contractor shall notify the Contract Administrator of any deviations in the Shop Drawings from requirements of the Contract. The Contractor shall allow one week for the Contract Administrator's review.

D24.4 The Contract Administrator shall review the Shop Drawings promptly or in accordance with a schedule agreed upon in writing. The Contract Administrator, upon completion of the review, shall communicate either his acceptance or rejection of the Shop Drawings to the Contractor. The Contract Administrator's review and acceptance shall be for conformity to the design concept of the Work and for compliance with the Contract.

D24.5 The acceptance of the Shop Drawings for a component or a subassembly shall not constitute acceptance of the assembly of which it is a part.

D24.6 The review shall not relieve the Contractor of responsibility for errors and omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract unless a deviation on the Shop Drawings, identified by the Contractor, has been approved by the Contract Administrator.

D24.7 The Contractor shall promptly make any changes in the Shop Drawings which the Contract Administrator may require and which are consistent with the Contract and shall promptly resubmit same to the Contract Administrator for review and acceptance unless otherwise directed by the Contract Administrator. When resubmitting the Shop Drawings, the Contractor shall notify the Contract Administrator of any revisions other than those requested by the Contract Administrator.

D24.8 No Work called for by Shop Drawings shall be undertaken by the Contractor until the Contract Administrator's review is completed and the acceptance of same has been communicated to the Contractor.

D24.9 Each Shop Drawing shall:

(a) be sheet size ISO A4;

(b) be submitted as one (1) reproducible transparency and four (4) prints;

(c) show, in the lower right-hand corner, the following information:

(i) the project title

(ii) the Bid Opportunity Number or other project number assigned by the Contract Administrator

(iii) the name of the depicted item exactly as named in the Specifications or on the Drawings

(iv) the project series number and the name of the area in which item is used

(v) the Specification section number (if applicable)

(vi) the option proposed (if applicable)

(vii) the drawing date (to be revised for each resubmission)

(d) be stamped with the seal of a Professional Engineer licensed to practise in the Province of Manitoba, and signed and dated by said Engineer.

D25. ENVIRONMENTAL PROTECTION PLAN

D25.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Plan as herein specified.

D25.2 The contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal

(i) Canadian Environmental Assessment Act (CEAA) C.37;

(ii) Fisheries Act C.F14;

(iii) Transportation of Dangerous Goods Act and Regulations c.34; and

(iv) Navigable Waters Protection Act.

(b) Provincial

(i) The Dangerous Goods Handling and Transportation Act D12;

(ii) The Endangered Species Act E111;

(iii) The Environment Act c.E125

(iv) The Fire Prevention Act F80;

(v) The Manitoba Heritage Resources Act H39-1;

(vi) The Manitoba Noxious Weeds Act N110;

(vii) The Manitoba Nuisance Act N120;

(viii) The Public Health Act c.P210;

(ix) The Workplace Safety and health Act W210;

(x) Current applicable Associated Regulations(Note: Provincial regulations updated as of September 199) and

(xi) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.

(c) Municipal

(i) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000'

(ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000; and

(iii) Any other applicable Acts, Regulations, and By-laws.

D25.3 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

(i) Storage on construction materials shall be confined to the closed areas of Jubilee Avenue Ramp and Pembina Highway Ramp.

(b) Fuel Handling and Storage

(i) The Contractor shall obtain all necessary permits from Manitoba Environment for the handling and storage of fuel products and shall provide copies to the Contract Administrator.

(ii) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.

(iii) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.

(iv) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervious material. If this type of material is not available, the dyke shall be constructed of locally available material and lined with high-density polyethylene (HDPE). Furthermore, the fuel

storage area(s) shall be secured by a barrier such as a high fence and gate to prevent vandalism.

(v) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.

(vi) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.

(vii) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.

(viii) Refuelling of mobile equipment and vehicles shall take place at least 100 metres from a watercourse.

(ix) The area around storage sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.

(x) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available on short notice.

(c) Waste Handling and Disposal

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

(ii) At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction Site, other than at a dedicated storage area as may be approved by the Contract Administrator.

(iii) The Contractor shall, during and at the completion of construction, clean-up the construction area and all resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Manitoba Regulation #150/91. Exceptions are liquid industrial and hazardous wastes which require special disposal methods (refer to Section 30.5D.).

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

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

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

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

(viii) Waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

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

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

(i) Dangerous goods/hazardous waste are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.

(ii) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.

(iii) The Contractor shall have on Site staff that is trained and certified in the handling of the dangerous/hazardous goods, when said dangerous/hazardous goods are being utilized on Site for the performance of the Work.

(iv) Different waste streams shall not be mixed.

(v) Disposal of dangerous goods/hazardous wastes shall be at approved hazardous waste facilities.

(vi) Liquid hydrocarbons shall not be stored or disposed of in earthen pits on Site.

(vii) Used oils shall be stored in appropriate drums or tankage until shipment to waste oil recycling centres, incinerators, or secure disposal facilities approved for such wastes.

(viii) Used oil filters shall be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.

(ix) Dangerous goods/hazardous waste storage areas shall be located at least 107 metres away from the edge of the water line for normal summer water levels and be dyked.

(x) Dangerous goods/hazardous waste storage areas shall not be located so as to block natural drainage.

(xi) Runoff from a dangerous goods/hazardous waste storage areas shall not be allowed to cause siltation of a watercourse.

(xii) Dangerous goods/hazardous waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

(e) Emergency Response

(i) The Contractor shall ensure that due care and caution is taken to prevent spills.

(ii) The Contractor shall report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table 1 below) to Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 945-4888.

(iii) The Contractor shall designate a qualified supervisor as the on-Site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.

(iv) The following actions shall be taken by the person in charge of the spilled material or the first person(s) arriving at the scene of a hazardous material accident or the on-Site emergency response coordinator:

i. Notify emergency-response coordinator of the accident:

- identify exact location and time of accident;
- indicate injuries, if any; and
- request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup).

ii. Attend to public safety:

- stop traffic, roadblock/cordon off the immediate danger area;
- eliminate ignition sources; and
- initiate evacuation procedures if necessary.

iii. Assess situation and gather information on the status of the situation, noting:

- personnel on Site;
- cause and effect of spill;
- estimated extent of damage;
- amount and type of material involved; and
- proximity to waterways, sewers, and manholes.

iv. If safe to do so, try to stop the dispersion or flow of spill material:

- approach from upwind;
- stop or reduce leak if safe to do so;
- dyke spill material with dry, inert absorbent material or dry clay soil or sand;
- prevent spill material from entering waterways and utilities by dyking;
- prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking; and

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

(v) The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to Manitoba Environment according to The Dangerous Goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.

(vi) When dangerous goods are used on Site, materials for containment and cleanup of spill material (e.g. absorbent materials, plastic oil booms, and oversized recovery drums) shall be available on Site.

(vii) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to with in-house resources without formal notification to Manitoba Environment.

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

(ix) The on-site emergency response coordinator shall contact The Canadian Coast Guard, Kenora, Ontario (807) 468-6441, if the spill material reaches and is on or in the Red or Assiniboine Rivers.

TABLE 1
SPILLS THAT MUST BE REPORTED TO THE MANITOBA CONSERVATION AS ENVIRONMENTAL ACCIDENTS

Classification	Hazard	Reportable Quantity/Level
1	Explosives	All
2.1	Compressed Gas (flammable)	100 L*
2.2	Compressed Gas	100 L*
2.3	Compressed Gas (toxic)	All
2.4	Compressed Gas (corrosive)	All
3	Flammable Liquids	100 L
4	Flammable Solids	1 kg
5.1 PG** I & II	Oxidizer	1 kg or 1 L
PG III	Oxidizer	50 kg or 50 L
5.2	Organic Peroxide	1 kg or 1 L
6.1 PG** I & II	Acute Toxic	1 kg or 1 L
PG III	Acute Toxic	5 kg or 5 L
6.2	Infectious	All
7	Radioactive	Any discharge or radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface
8	Corrosive	5 kg or 5 L
9.1	Miscellaneous (except PCB mixtures)	50 kg
9.1	PCB Mixtures	500 g
9.2	Aquatic Toxic	1 kg or 1 L
9.3	Wastes (chronic toxic)	5 kg or 5 L

* Container capacity (refers to container water capacity)
** PG = Packing Group(s)

(f) Noise

(i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, and the Province of Manitoba Environment Act Licence, unless otherwise accepted in advance by the Contract Administrator.

(ii) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable limits. The Contractor shall also demonstrate to the Contract Administrator that

Works to be performed during the night-time period, on Sundays, and Holidays as stated in the Licence shall not exceed the approved limit.

(g) Dust

(i) Dust control practices implemented by the Contractor during construction shall include regular street cleaning and dampening of construction access roads and Work areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.

(ii) Only water or chemicals approved by the Contract Administrator shall be used for dust control. The use of waste petroleum or petroleum by-products is not permitted.

(iii) The Contractor shall ensure that trucks which are used to haul excavated material and backfill material to and from the Work Site utilize tarpaulin covers during transport to prevent material from falling onto the street and creating dust.

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

(h) Erosion Control

(i) The Contractor shall develop a sediment control plan prior to beginning construction to the satisfaction of the Contract Administrator.

(ii) Exposure of soils shall be kept to a minimum practical amount, acceptable to the Contract Administrator. The cover of trees and undergrowth shall be preserved to the maximum extent possible.

(iii) Sediment control fencing, or other such erosion control structures, shall be employed wherever construction activity increases the potential for runoff to carry sediment into a drainage channel or other watercourse. The Contractor shall inspect all such structures daily during heavy construction activity in the areas of the structures and after a heavy rainfall to ensure their continued integrity.

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

(v) The disturbed surface shall be revegetated so as to create a dense root system in order to defend against soil erosion on the right-of-way and any other disturbed areas susceptible to erosion.

(vi) The loss of topsoil and the creation of excessive dust by wind during construction shall be prevented by the addition of temporary cover crop, water, or tackifier, if conditions so warrant.

(i) Vegetation

(i) Vegetation shall not be disturbed without written permission from the Contract Administrator.

(ii) The Contractor shall protect plants or trees which may be at risk of accidental damage. Such measures may include protective fencing or signage and shall be approved in advance by the Contract Administrator.

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

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

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

(vi) Trees damaged during construction activities shall be examined by bonded tree carte professionals; viable trees damaged during construction activities shall be pruned according to good practise by bonded tree care professionals.

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

(j) Landscaping

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

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

(k) Construction Traffic

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

(ii) The Contractor shall adhere to the Standard Provisions of the Standard Construction Specifications, and of the Manual of Temporary Traffic Control in Work Areas on City Streets of The City of Winnipeg, Works & Operations Division.

(iii) The Contractor's laydown area, construction Site and access road shall be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to construction area and to control any potential hazard to the public, particularly children.

(iv) For circumstances where the Contract Administrator has accepted Site access of special equipment or material, the Contractor shall provide adequate flagmen for traffic control in the vicinity of any public buildings.

(l) Access

(i) The Contractor shall maintain access to affected residential properties.

(ii) The Contractor shall provide or maintain general and off-street access to any affected business during construction.

D26. AUTHORIZED WORK ON PRIVATE PROPERTY

D26.1 The Contractor shall confine his Works to the right-of-way or easements as much as possible. Where Work is required to be done on or accessed through private property, the Contractor shall obtain written permission from the property owner and provide a copy to the Contract Administrator.

D27. LAYOUT OF WORK

D27.1 Bridge Work

D27.1.1 The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Bridge Work.

D27.1.2 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. He shall provide all required instruments and competent personnel for performing all layouts.

D27.1.3 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.

D27.1.4 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

D27.2 Roadwork

D27.2.1 Further to the City of Winnipeg Specification GC 6.28(h), the Contract Administrator shall mark, to the extent determined to be necessary, the location, alignment and elevation of

the Work by means of stakes or marks, and the Contractor shall make the completed Works conform to the lines and marks thus indicated.

D27.2.2 Stakes and marks required shall be provided no later than one (1) Business Day following the day on which the Contractor requests such stakes and/or marks, except where the Contractor's request is made immediately following asphalt planning operations. Then the Contract Administrator may require a maximum of two (2) Business Days to provide stakes and marks as a result of required adjustments to final design grades.

D27.2.3 The Contractor shall notify the Contract Administrator immediately of the disturbance of any such stakes or marks. The cost of correcting any errors arising out of neglect of the Contractor to so notify the Contract Administrator shall be borne entirely by the Contractor, as well as the cost of replacing any disturbed stakes or marks.

D27.2.4 Before commencing Work, the Contractor shall satisfy themselves as to the meaning and correctness of all stakes and marks and no claims shall be entertained by the City on account of any alleged inaccuracies. If any error is suspected in the Drawings, Specifications or the directions of the Contract Administrator, Work shall be discontinued until the errors are rectified, but no claims shall be made on account of any delay occasioned thereby.

D27.2.5 The Contractor shall determine and provide all dimensions and elevations measured from the stakes or marks.

D28. COOPERATION WITH OTHERS

D28.1 The Contractor’s attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working on the structure, approach roadways, adjacent roadways or rights-of-way. The activities of these agencies may coincide with the Contractor’s execution of the Work, and it will be the Contractor’s responsibility to cooperate to the fullest extent with the other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of the Contract.

MEASUREMENT AND PAYMENT

D29. PAYMENT

D29.1 Further to C12, effective January 1, 2007, the City may at its option pay the Contractor by direct deposit to the Contractor’s banking institution.

D30. PAYMENT SCHEDULE

D30.1 Further to C12, payment shall be in accordance with the following payment schedule:

D30.2 Custom manufactured items may be included in progress estimates prior to installation on site based on the following payment schedule:

(i) 50% of the bid supply costs, on manufacture and delivery to site;
(ii) 50% of the bid supply costs on installation;
(iii) 100% of the bid installation costs on installation.

WARRANTY

D31. WARRANTY

D31.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter, except where longer warranty periods are specified in the Specifications, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D31.2 Notwithstanding C13.2 or D31.1, 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 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.

D31.2.1 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.

D31.3 At least two (2) weeks prior to the expiration of the Warranty Period, or upon correction of all outstanding defects and deficiencies, whichever is later, the Contractor shall arrange, attend, and assist in acceptance inspection of the Work. The Contract Administrator shall, on being satisfied that all outstanding defects and deficiencies in the Work have been corrected, issue a Certificate of Acceptance for the Work to be dated not earlier than two (2) years after the date of the Certificate of Total Performance, or the date that the Contractor corrects the final defects and deficiencies, whichever is the later, thereby terminating the Warranty Period. The Certificate of Acceptance will indicate acceptance of the due performance of the Contract.

FORM H1: PERFORMANCE BOND
(See D10)

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. 133-2010

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)
(See D10)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 133-2010

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

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

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D11)

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

Name	Address

FORM K: EQUIPMENT
(See D12)

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D12)

JUBILEE AVENUE OVERPASS REHABILITATION AND ASSOCIATED ROADWORKS

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
GENERAL DRAWINGS	
B124-10-01	COVER SHEET
B124-10-02	DRAWING LIST, DESIGN DATA AND ABBREVIATIONS
B124-10-03	EXISTING GENERAL ARRANGEMENT
B124-10-04	GENERAL ARRANGEMENT
SUBSTRUCTURES - PIER MODIFICATIONS	
B124-10-05	SHORING SCHEME FOR BEARING REPLACEMENT
B124-10-06	BEARING REPLACEMENT DETAILS
B124-10-07	PIER CORROSION PROTECTION
DECK REHABILITATION & MODIFICATIONS	
B124-10-08	DECK CONCRETE & REINFORCING DETAILS
B124-10-09	DECK EXTENSION CONCRETE & REINFORCING DETAILS
B124-10-10	FINAL PAVEMENT ELEVATIONS FOR DECK
BARRIERS, APPROACH SLABS AND GUARDRAILS	
B124-10-11	CONCRETE BARRIERS LAYOUT & REINFORCING DETAILS I
B124-10-12	CONCRETE BARRIERS REINFORCING DETAILS II
B124-10-13	ALUMINIUM TRAFFIC BARRIER RAIL LAYOUT & DETAILS I
B124-10-14	ALUMINIUM TRAFFIC BARRIER RAIL DETAILS II
B124-10-15	APPROACH SLAB CONCRETE AND REINFORCING DETAILS I
B124-10-16	APPROACH SLAB CONCRETE AND REINFORCING DETAILS II
REINFORCED CONCRETE PAVEMENT AND EXPANSION JOINTS	
B124-10-17	MSE WALL LAYOUT AND DETAILS & REINFORCED CONCRETE PAVEMENT LAYOUT
B124-10-18	REINFORCED CONCRETE PAVEMENT & EXPANSION JOINT DETAILS
B124-10-19	EXPANSION JOINT DETAILS I
B124-10-20	EXPANSION JOINT DETAILS II
B124-10-21	REINFORCED CONCRETE PAVEMENT LAYOUTS I
B124-10-22	REINFORCED CONCRETE PAVEMENT LAYOUTS II
B124-10-23	REINFORCED CONCRETE PAVEMENT LAYOUTS III
B124-10-24	REINFORCED CONCRETE PAVEMENT LAYOUTS IV
B124-10-25	REINFORCING SCHEDULE I
B124-10-26	REINFORCING SCHEDULE II
B124-10-27	REINFORCING SCHEDULE III
B124-10-28	REINFORCING SCHEDULE IV
ROADWORKS	
B124-10-29	RAMP CONSTRUCTION STAGING
B124-10-30	REMOVALS 1 OF 3

B124-10-31	REMOVALS 2 OF 3
B124-10-32	REMOVALS 3 OF 3
B124-10-33	HORIZONTAL ROADWAY GEOMETRY 1 OF 3
B124-10-34	HORIZONTAL ROADWAY GEOMETRY 2 OF 3
B124-10-35	HORIZONTAL ROADWAY GEOMETRY 3 OF 3
B124-10-36	PAVEMENT ELEVATIONS 1 OF 3
B124-10-37	PAVEMENT ELEVATIONS 2 OF 3
B124-10-38	PAVEMENT ELEVATIONS 3 OF 3
B124-10-39	JUBILEE AVENUE RAMP PROFILE 1 OF 2
B124-10-40	JUBILEE AVENUE RAMP PROFILE 2 OF 3
B124-10-41	PEMBINA HIGHWAY RAMP PROFILE 1 OF 2
B124-10-42	PEMBINA HIGHWAY RAMP PROFILE 2 OF 2
B124-10-43	PAVING AND GRADING 1 OF 3
B124-10-44	PAVING AND GRADING 2 OF 3
B124-10-45	PAVING AND GRADING 3 OF 3
B124-10-46	PAVEMANT SECTIONS
B124-10-47	OVERHEAD SIGN S-678 PLAN & DETAILS
B124-10-48	ALUMINUM BALANCED BARRIER LOCATIONS 1 OF 2
B124-10-49	ALUMINUM BALANCED BARRIER LOCATIONS 2 OF 2
B124-10-50	JUBILEE AVENUE PLAN/PROFILE SHEET 1 OF 2
B124-10-51	JUBILEE AVENUE PLAN/PROFILE SHEET 2 OF 2

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. VERIFICATION OF WEIGHTS

E3.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

E3.1.1 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

E3.1.2 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

(a) Checking Contractor's scales for Consumer & Corporate Affairs certification seals.

(b) Observing weighing procedures.

(c) Random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale.

(d) Checking tare weights shown on delivery tickets against a current tare.

E3.1.3 No charge shall be made to The City for any delays or loss of production caused by such inspection and verification.

E3.2 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.

E3.2.1 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

(a) Upon which scale the truck or truck/trailer(s) combination was weighed.

(b) The mechanically printed tare weight.

(c) The license number(s) of the truck and trailer(s).

(d) The time and date of weighing.

E4. MOBILIZATION AND DEMOBILIZATION

E4.1 Description

(a) This Specification covers all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

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

E4.2 Scope of Work

E4.2.1 The Work under this specification shall include but not be limited to:

(a) Mobilizing and demobilizing on-site Work facilities;

(b) Supplying, setting up, laying out, and removing site office facilities as detailed in E5 “Office Facilities”;

(c) Supplying and installing secure fencing around the site; and

(d) Maintaining and removing any access roadway.

E4.3 Materials

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

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

E4.4 Equipment

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

E4.5 Construction Methods

E4.5.1 Layout of On-Site Work Facilities

(a) The Contractor shall mobilize all on-site Work and other temporary facilities.

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

E4.5.2 Cellular Telephone Communication

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

E4.5.3 Secure Site Fencing

(a) A minimum 1.8 m high chain-link secure fence around the site lay-down and Work site areas shall be installed prior to commencement of site activities.

(b) The fencing shall remain secure and in place during all construction facilities.

(c) The fencing shall be removed upon demobilization of on-site Work facilities.

E4.5.4 Traffic Gates

(a) The Contractor shall supply, install, maintain, and remove steel gates to keep non-Contract traffic and pedestrians out of the Work site.

(b) The gates shall be removed upon completion of construction activities.

E4.5.5 Access Roadway

(a) The Contractor shall maintain any access roadway they install.

(b) The access road shall be maintained on a regular basis to provide continual unrestricted site access, to the satisfaction of the Contract Administrator.

(c) Upon completion of the Work, the area shall be restored to its original condition.

E4.5.6 Restoration of Existing Facilities

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

E4.6 Method of Measurement

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

E4.7 Basis of Payment

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

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

(a)	When Contract Administrator is satisfied that construction has commenced	30%
(b)	During construction	60%
(c)	Upon completion of the project	10%

E5. OFFICE FACILITIES

E5.1 The Contractor shall supply office facilities meeting the following requirements:

(a) The field office shall be for the exclusive use of the Contract Administrator.

(b) The building shall be conveniently located near the site of the Work.

(c) The building shall have a minimum floor area of 25 square metres, a height of 2.4m with a window and a door entrance with a suitable lock.

(d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18○C or 24-25○C.

(e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.

(f) The building shall be furnished with one desk, one drafting table, table 3m x 1.2m, one stool, one four drawer legal size filing cabinet, and a minimum of 12 chairs.

(g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.

(h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he deems it necessary.

E5.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E5.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

E6. PROTECTION OF EXISTING TREES

E6.1 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.

E6.2 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.

E6.3 No separate measurement or payment will be made for the protection of trees.

E6.4 Except as required in clause E6.1(c) and E6.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E7. TRAFFIC CONTROL

E7.1 Description

(a) The Work covered under this item shall include all operations related to establishing and executing the public access and traffic control plan as hereinafter specified.

(b) The Work includes furnishing all superintendence / overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work associated with the public access and traffic control.

E7.2 Notification

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

E7.3 Construction Methods

E7.3.1 General

(a) The Contractor will be responsible for pedestrian and traffic control at the Site as acceptable to the Contract Administrator.

(b) For traffic control in the immediate Work area, the Contractor shall erect and maintain all applicable traffic control devices in accordance with the provision contained in the latest edition of the "Manual of Temporary Traffic Control in Work Areas on City Streets", issued by the City of Winnipeg.

(c) The Contractor shall provide and maintain flagmen in accordance with the above mentioned manual.

(d) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the above-mentioned manual and shall, at all times, ensure that maximum protection is afforded to the road users and that his operations in no way interfere with the safe operation of traffic.

(e) Improper signing will be sufficient reason for the Contract Administrator or Inspector to immediately shut down the entire job.

(f) Barricades supplied and installed by the Contractor shall show the telephone number(s) at which he can be reached twenty-four(24) hours per day, seven (7) days per week.

(g) During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present a hazard to motorists or pedestrians.

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

(i) 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.

(j) Pedestrian passage must be maintained in a safe manner acceptable to the Contract Administrator.

E7.4 Measurement and Payment

(a) Public Access and Traffic Control are considered incidental to the Works of Specification E4 and no additional measurement or payment will be made.

E8. TRAFFIC MANAGEMENT

E8.1 Further to clause 3.7 of CW 1130-R1:

E8.1.1 Bridge Construction – The entire Jubilee Avenue Overpass, including approach ramps, will be closed to vehicular traffic during the rehabilitation of the overpass structure by City of Winnipeg Traffic Serviced Department. Riverside Drive will also be closed to through traffic for the duration of the overpass closure by City of Winnipeg Traffic Services Department.

E8.1.2 Stage 1 Construction – Maintain a minimum of two lanes at all times on southbound Pembina highway through the construction zone. The Contractor will be permitted to temporary close only the southbound gutter lane of Pembina Highway adjacent to the Work area, this closure will be allowed for a period of fifteen (15) working days maximum. Any closures required beyond the fifteen (15) Working Days shall occur outside the PM Peak Hours of 3:00 p.m. to 6:00 p.m.

(a) The Contractor will be responsible for all signage related to the temporary closure and securing of his work and diversion of traffic around his work area. All other regulatory or detour signage will be completed by the City of Winnipeg Traffic Services Department.

E8.1.3 Stage 2 Construction - Maintain a minimum of one lane of traffic in each direction at all times on Jubilee Avenue through the Jubilee Avenue intersection during construction of the deceleration lane to the westbound ramp pavement for the new ramps to the Jubilee overpass and during asphalt resurfacing and median construction on Jubilee Avenue..

(a) The Contractor shall also be responsible for closing the sidewalk on the north side of Jubilee Avenue to pedestrian traffic. Pedestrians on the north side of Jubilee Avenue west of the intersection and on the south side of Jubilee shall be directed to the crossing at Pembina Highway. Pedestrians on the north side of Jubilee Avenue east of the intersection shall be directed to the next pedestrian crossing east on Jubilee Avenue or to the northbound pathway east of the overpass.

(b) All lane closures on Jubilee Avenue are to be coordinated with the Jubilee Avenue Active Transportation and Watermain Renewal project lane closures. At no time will a lane closure be allowed if the adjacent lane is closed for work related to either of these two projects. The Contractor will be responsible for all signage related to the closure and securing of his work area or diversion of traffic around his work area. All other regulatory or detour signage will be completed by the City of Winnipeg Traffic Services Department.

E9. PEDESTRIAN PROTECTION / ACCOMMODATION

E9.1 Description

(a) This Specification shall cover all operations relating to the provision of safe access for pedestrians and cyclists around the construction site and on the underbridge sidewalk at the East end of the Overpass, as specified herein.

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

E9.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) The supply, erection, and maintenance of pedestrian protection, as specified herein;

(ii) The provision of all signage necessary to direct pedestrian traffic;

(iii) The provision of all other measures necessary to ensure safe pedestrian access through the construction site to the satisfaction of the Contract Administrator; and

(iv) It is intended that the Contractor provide pedestrian protection and guidance at all times during the Project.

E9.3 Submittals

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

E9.4 Materials

E9.4.1 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.

E9.5 Equipment

E9.5.1 General

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

E9.6 Construction Methods

E9.6.1 Pedestrian Protection Enclosure

(a) A pedestrian protection wall at the location of the underbridge sidewalk on the East side of the Site, complete with overhead protection, shall be a minimum of 2400 mm high and shall consist of support posts and minimum 13 mm thick plywood. The support posts shall have provision for anchorage to prevent movement or overturning

of the pedestrian protection due to wind. The pedestrian protection shall be designed for all applicable loading including wind loading in accordance with the requirements of the National Building Code. Adequate lighting shall be provided attached to the inside of the temporary pedestrian enclosure. Lighting shall be provided for the length of the pathway enclosure.

E9.6.2 Safety Precautions

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

E9.6.3 Maintenance of the Pedestrian Protection Enclosure

(a) The Contractor shall maintain the Pedestrian Protection Enclosure in good working order at all times to the satisfaction of the Contract Administrator.

(b) The sidewalk shall be kept free of all construction materials, debris, and equipment.

E9.7 Quality Control

E9.7.1 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.

E9.7.2 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.

E9.8 Measurement and Payment

(a) There will be no measurement for this work. This item of Work shall be considered incidental to “Mobilization and Demobilization” and no separate payment will be paid for the Work.

E10. WATER OBTAINED FROM THE CITY

E10.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E11. RECYCLED CONCRETE BASE COURSE MATERIAL

E11.1 DESCRIPTION

(a) Further to CW 3110, this specification covers supply and placement of recycled concrete base course material for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks.

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

E11.2 Definitions

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

E11.3 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.

E11.4 MATERIALS

E11.4.1 Recycled Concrete Base Course Material

(a) Recycled concrete base course material when used for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks will be considered equal to granular or limestone base course material specified in Section 2.2 of CW 3110.

(b) Recycled concrete base course material will be approved by the Contract Administrator.

(c) Recycled concrete base course material will consist of sound durable particles produced by crushing, screening, and grading of recovered concrete materials, free from soft material that would disintegrate through decay or weathering.

(d) The recycled concrete base course material will be well graded and conform to the following grading requirements:

Recycled Concrete Base Course Material Grading Requirements

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE
20 000	100%
5 000	40% - 70%
2 500	25% - 60%
315	8% - 25%
80	6% - 17%

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

(f) The amount of deleterious material will be limited to a maximum of two percent of the total dry weight.

E11.5 CONSTRUCTION METHODS

E11.5.1 Placement of Recycled Concrete Base Course Material

(a) Place and compact recycled concrete base course material as a levelling course to a maximum thickness of 50 millimetres.

(b) Spread materials uniformly to avoid segregation free of pockets of fine and coarse material.

(c) Level and compact to the finished elevation. Compact to 100% Standard Proctor Density for Full-Depth Partial Slab Patches (Class A, B, C, & D) and 90% Standard Proctor Density for miscellaneous concrete slabs and sidewalks.

(d) Maintain the finished material until the pavement or sidewalk is placed.

E11.6 MEASUREMENT AND PAYMENT

E11.6.1 Recycled Concrete Base Course Material

(a) The supplying, placing and compaction of recycled concrete base course material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the "Supplying and Placing Base Course Material" as specified in accordance with CW 3110.

(b) No measurement or payment will be made for material placed as a levelling course under miscellaneous concrete slabs and sidewalks where the costs are included in accordance with CW 3235 and CW 3325.

(c) No measurement or payment will be made for materials rejected by the Contract Administrator.

E12. REMOVAL, SALVAGE AND REINSTALLATION OF ALUMINUM BALANCED BARRIER

E12.1 Description

(a) Further to CW 3650 this specification covers the removal and salvage of the existing aluminum balanced barrier on Jubilee Avenue westbound at the entry to the existing westbound ramp to the structure. Also included is the removal, salvage and reinstallation of the aluminum balanced barrier at various location adjacent to the roadway shown on the drawings.

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

E12.2 Referenced Standard Construction Specifications

(a) CW 3650 – Installation of Aluminum Balanced Barrier.

E12.3 Material

E12.3.1 General

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

E12.3.2 Handling and Storage of Materials

(a) All material shall be handled and stored in a careful and workmanlike manner, in accordance with Section 5.2 of CW 3650, to the satisfaction of the Contract Administrator.

(b) Any damaged or missing material or components resulting from handling and storage operations shall be replaced at the Contractor's expense, to the satisfaction of the Contractor Administrator.

(c) All aluminum balanced barrier rail and posts are to be stored on wood blocking and shall not be stored directly on the ground. The barrier components to be salvaged and returned to the City shall be transported on wood blocking and shall be secured to prevent movement which may cause damage during transportation.

(d) The contractor shall provide equipment at the City Bridge Yard for unloading and placement of the material at the location directed by City personnel.

E12.3.3 Balanced Barrier Components

(a) All components shall be in accordance with Section 5.4 of CW 3650 and the Drawings.

(b) Salvaged barrier railing, splice bars, and clamp bars deemed to be in good condition based on the pre-removal inspection shall be used for reinstallation.

(c) Splice bars and clamp bars with cap screws broken into them due to the Contractor's removal operation shall be considered to be in good condition. The Contractor has the option to drill out and re-top the holes or replace with new material at his expense.

(d) Salvaged barrier posts deemed to be in good condition after they are removed fro the ground and cleaned shall be used for reinstallation

(e) Should there not be sufficient salvaged material in good condition available on site, the Contractor shall supply additional barrier railing, splice bars, clamp bars, and barrier posts.

(f) Miscellaneous hardware including stainless steel cap screws and washers shall be supplied new by the Contractor.

E12.3.4 Granular Backfill Material

(a) Granular backfill material shall conform to the requirements of Section 5.5 of CW 3650. Crushed limestone base course in not allowed for use.

E12.3.5 Alkali-resistant Bituminous Paint

(a) Alkali resistant bituminous paint shall conform to the requirements of Section 5.6 of CW 2650.

E12.3.6 Miscellaneous Materials

(a) The Contractor shall supply all miscellaneous materials, as approved by the Contract Administrator, to ensure the salvaging and reinstallation of the aluminum balanced barrier.

E12.4 Construction Methods

E12.4.1 Pre-Removal Inspection

(a) Prior to the removal and dismantling of the aluminum balanced barrier, the Contractor and Contract Administrator shall jointly inspect the barrier taking note of any damage above ground level and determining which components cannot be used for reinstallation.

(b) The layout and location of the barrier posts, railing and rail splices shall be recorded by the Contractor for locations requiring reinstallation. Generally, the barrier rail splice location for top and bottom rails shall be staggered at alternate post locations, 300 mm past the barrier post in the direction of adjacent traffic. If the existing installations do not conform to this layout, the Contract Administrator will provide a revised layout prior to reinstallation. Additional rails, posts, splice bars, and clamp bars required due to the revised layout will be supplied by the Contractor if sufficient salvaged material is not available on site.

E12.4.2 Removal of Aluminum Balance Barrier

(a) Further to Section 9.6 of CW 3650, removal of the barrier railing components shall be undertaken in careful and workmanlike manner. Material damaged through negligent operations shall be replaced by the Contractor at his expense.

(b) A minimum of 48 hours prior to commencement of dismantling operations, the Contractor shall spray all the existing cap screws with an anti-seize compound to the satisfaction of the Contract Administrator.

(c) All cap screws shall be initially loosed with a hand wrench to limit the number of broken cap screws in clamp bars and splice bars. Once loosened, the bolts may be removed with an impact wrench unless otherwise directed by the Contract Administrator.

E12.4.3 Inspection and Preparation of Barrier Posts

(a) After the barrier posts are removed, all posts shall be thoroughly cleaned to the satisfaction of the Contract Administrator.

(b) The Contract Administrator will inspect the cleaned posts and determine the ones that can be used for reinstallation.

(c) All posts that will be reinstalled shall be recoated with alkali resistant bituminous paint in accordance with Section 9.4 of CW 3650.

E12.4.4 Installation of Balanced Aluminum Barrier

(a) The installation of balanced aluminum barrier shall be at the locations shown on the Drawings based on layouts approved or provided by the Contract Administrator.

(b) The installation and acceptance of the barrier shall be in accordance with Section 9 of CW 3650.

E12.4.5 Salvaging of Existing Guardrail

(a) Further to Section 9.6 of CW 3650, all surplus salvaged material shall be delivered to the City Bridge Yard located at 849 Ravelston Avenue. Contact Mike Terleski, C.E.T. at 794-8510 to arrange a suitable time and date for delivery.

(b) Further to Section 5.2 of CW 3650, the salvage material shall be properly placed in the bridge yard at location determined by City personnel in a manner accepted by the City.

(c) Salvaged material deemed unsuitable for reinstallation shall also be returned to the City Bridge yard.

(d) Prior to delivery, splice bars and clamp bars are to be removed from the aluminum barrier rail.

(e) Broken cap screws shall be removed from splice bars and clamp bars and the holes re-tapped prior to delivery. Alternately, the Contractor may supply new material or have the material value, as determined by the Contract Administrator, deducted from a Contract progress payment.

E12.5 Measurement and Payment

(a) Removal Salvage and Reinstallation of aluminum balanced barrier will be measured and paid for in accordance with City of Winnipeg Standard Construction Specification CW 3650.

E13. REMOVAL, SALVAGE AND RELOCATION OF OVERHEAD SIGN STRUCTURES

E13.1 Description

(a) This specification covers the removal and salvage of the existing pole mount sign structure (S-540) on Jubilee Avenue at the entry to the existing westbound ramp to the overpass. Also included will be the relocation of the existing cantilever sign structure (S-678) at the existing eastbound ramp on the north side of Jubilee Avenue, to the new location shown on the Drawings.

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

E13.2 Material

E13.2.1 Storage and Handling

(a) All material shall be handled carefully and transported in such a manner so as to ensure the material is not damaged. Any damaged or missing material or components shall be replaced at the contractor’s expense.

E13.2.2 Cement

(a) Cement shall be Type HS or HSb, high-sulfate-resistant, hydraulic cement, conforming to the requirement os SCA Standard A23.1-04.

E13.2.3 Concrete

(a) General

(i) Concrete repair material shall be compatible with the concrete substrate.

(b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair motors, where applicable, may be used having the following minimum properties in accordance with CSA A23.1-04.

(i) Class of Exposure: S-1

(ii) Compressive Strength @ 56 days + 35 PMa

(iii) Water / Cementing Materials Ratio _ 0.4

(iv) Air Content: Category 2 per Table 4 of CSA A23.1-04 (4 – 7 %)

(v) Cement – shall be as specified in E13.2.5

(c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.

(d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self compacting concrete may be used for pile foundations.

(e) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.

(f) The temperature of all types of concrete shall be between 15○C and 25○C at discharge. Temperature requirements for concrete containing silica fume shall be between 10○C and 18○C at discharge unless otherwise approved by the contract Administrator.

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

E13.2.4 Aggregate

(a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these test shall be provided to the Contract Administrator if requested. All aggregates shall comply with CSA A23.1.

(b) Coarse Aggregate

(i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's ix design. Gradation shall be in accordance with CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in SCA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".

(ii) Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic, or other deleterious matter, and shall have an absorption not exceeding 2.25%.

(iii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, and excess of thin particles or any other extraneous material.

(iv) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.

(v) Tests of the coarse aggregate shall not exceed the limits for standard for requirement prescribed in SCA A23.a, Table 12, for concrete exposed to freezing and thawing.

(c) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, Gradation FA1.

(ii) Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free form injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.

(iii) Test of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

E13.2.5 Cementing Materials

(a) Cementing materials shall conform to the requirements of CSA A3001.

(b) Silica Fume

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

(c) Fly Ash

(i) Fly ash shall be Type C1 or Type Fa and shall not exceed 25% by mass of cement.

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

E13.2.6 Admixtures

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

(b) Chemical admixtures shall conform to the requirement of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators, and air-reducing agents will not be permitted, unless otherwise approved by the Contract Administrator.

(d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing cilica fume.

(e) An aminocarboxylate based migrating corrosion inhibititor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject tot eh approval of the Contract Administrator.

E13.2.7 Water

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

E13.2.8 Concrete Supply

(a) Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.

(b) Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within 120 minutes after the introduction of the mixing water to the cementing materials and aggregates.

(c) The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E13.2.9 Reinforcing Steel

(a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

(b) All reinforcing steel shall conform to the requirements of E24.3.2.

E13.2.10 Anchor Bolts, Nuts, and Washers

(a) Anchor bolts, nuts, and washers shall be in accordance with CSA Standard G40.21 Grade 300W, and shall be hot-dip galvanized full length in accordance with CSA G164 for a minimum net retention of 600 g/m2, for the entire length of the anchor bolts. The threaded portion of the anchor bolts shall be 300 mm long. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E13.2.11 Anchor Bolt Templates

(a) Anchor bolt templates shall be CSA G40.21 Grade 300W, minimum 10 mm thick, and will be incidental to construction of new concrete pile foundation and no separate payment will be made.

E13.2.12 Non-Shrink Grout

(a) Grout as specified hereinafter shall be used for the construction of grout pads under sign structure base plates. Grout shall consist of a pre-mixed, non-metallic non-shrink group. Approved products are:

(i) M-Bed Standard grout by Sternson Ltd.;

(ii) CPD Non-shrink grout by Master Builders;

(iii) Set Non-shrink rout by Master Builders; and

(iv) Sikadur VPC grout by Sika Canada Inc. for cold weather construction (0○C to -20○C)

(b) The grout shall be of a consistency suitable for the application intended, as approved by the Contract Administrator.

E13.2.13 Miscellaneous Material

(a) Miscellaneous material incidental to this Work shall be as approved by the Contract Administrator.

E13.2.14 Equipment

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

E13.3 Construction Methods

E13.3.1 Removal and Salvage of Pole Mount Sign Structure (S-540)

(a) The Contract Administrator shall arrange for the removal of all signs and brackets prior to the removal of the overhead sign structures. The contractor shall be responsible for abandonment of the existing electrical services to the structures as applicable.

(b) The Contractor shall carefully remove and salvage the existing pole mount sign structure at the westbound ramp to the Jubilee Overpass. The existing pile foundation shall be demolished to 1.0 metre below finished grade and the resulting void shall be backfilled with compacted suitable site fill material.

(c) The pole mount sign structure and all related components shall be returned to the City of Winnipeg Public Works Bridge Yard at 849 Ravelson Ave. @W., Contact Mr. Miike Terleski, C.E.T. Ph 794-8510, a minimum of 24 hou4rs prior to delivery of material.

E13.3.2 Location and Alignment of Piles

(a) Pile construction shall not commence until the Contractor has obtained clearance from the appropriate Utility Authorities.

(b) Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.

(c) The deviation of the axis of any finished pile shall not differ by more than 1 percent from the vertical.

E13.3.3 Buried Utilities

(a) The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.

(b) The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.

(c) The contractors shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractors' operations in construction cast-in-place concrete piles, as determined by the contract Administrator.

E13.3.4 Excavation

(a) The Contractor is responsible for determining the excavation method at each pile location. For quantity purposes, Hydro-Jet excavation has been assumed whenever a utility or building appears to be within 1.0 metre of the edge of the pile or if there are overhead utility lines.

(b) Excavations for piles shall be made with equipment designed to remove a core of the diameter shown on the Drawings, or hydro-het excavation to a depth to bypass and/or expose adjacent utilities. A pile will be considered to be "hydro-het excavated" if at least 0.5 vertical metres of earth is excavated using hydro-jet excavation methods.

(c) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough "slack" in conduits to move them slightly to avoid interference with the pile locations. The contract Administrator may elect to alter the location of a pile if hydro-jet excavation shows that utilities cannot be avoided. If the pile location must be altered, the Contractor will be paid for the abandonment of the pile due to utility interference.

(d) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.

(e) All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.

(f) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after boring has been completed.

(g) If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole bored as near as possible to the location shown on the Drawings. I locations where underground utilities have been exposed, the underground utilities shall be covered with clean sand to 300 mm above the utility. Payment will not be made for condemned piles.

E13.3.5 Sleeving

(a) Timber or steel sleeving shall be used to temporarily line the bore to prevent bulging or caving of the walls and to protect men at work in the bore.

(b) The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

(c) The Sleeving shall be withdrawn as the concrete is placed in the bore. The sleeving shall extend at least 1.0 metre below the top of the freshly deposited concrete at all times.

(d) The clearance between the face of the bore hole and the sleeving shall not exceed 75 mm.

E13.3.6 Inspection of Bores

(a) Concrete shall not be placed in a bore until the bore has been inspected and approved by the Contract Administrator.

(b) The Contractor shall have available suitable light for the inspection of each bore throughout its entire length.

(c) All improperly set sleeving, bore, or bottom shall be corrected to the satisfaction of the Contract Administrator.

E13.3.7 Placing Reinforcing Steel

(a) Reinforcement shall be:

(i) Placed in accordance with the details shown on the drawings;

(ii) Rigidly fastened together; and

(iii) Lowered into the bore intact before concrete is placed.

(b) Spacers shall be utilized to properly locate the reinforcing steel cage in the bore.

E13.3.8 Placing Anchor Bolts

(a) The anchor bolts shall be aligned with a steel template matching the bolt holes in the sign structure base plate. The setting template shall be held in place by the top and bottom nuts of the anchor bolts. Extreme care shall be used in this operation. Placement of anchor bolts without the steel template with not be permitted.

(b) The threaded portion of the anchor bolts projecting above the top surface of pile shall be coated with oil, before the concrete is poured, to minimize the fouling of threads splattered by concrete residue.

E13.3.9 Forms

(a) For bored piles, the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 mm below final grade.

(b) For “hydro-jet excavated” piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 mm below final grade.

(c) In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform. The minimum depth of the tubular forms (Sonotube) shall be as specified by E13.3.9(a)and E13.3.9(b)

(d) The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.

E13.3.10 Placing Concrete

(a) Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts and conduits are properly positioned prior to placement of concrete.

(b) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile.

(c) Concrete shall be placed to the elevations as shown on the drawings. The top surface of the pile shall be finished smooth and even with a hand float.

(d) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the contract Administrator. I the event that tremie concrete is allowed by the Contract Administrator, the concrete shall be placed as specified herein.

E13.3.11 Tremie Concrete

(a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the bore until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pie shall have a suitable gate in the bottom to prevent

water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

(b) Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the bore and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry bore.

E13.3.12 Protection of Newly Placed Concrete

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

E13.3.13 Curing Concrete

(a) The top of the freshly finished concrete piles shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10○C for at least seven (7) consecutive days thereafter.

(b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

(c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.

(d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3○ in one hour or 20○ in twenty-four hours.

E13.3.14 Form Removal

(a) Forms shall not be removed for a period of at least 24 hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

(b) The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

(c) The field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E13.3.15 Patching of Formed Surfaces

(a) Immediately after forms around top of pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed.

(b) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

(c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and the applying patching mortar. A slurry grout consisting of water and cement, shall be well-brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E13.3.16 Cold Weather Concreting

(a) Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10○C for a minimum of three (3) days or until the concrete has reached a minimum compressive strength of

20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.

E13.3.17 Relocation of Cantilever Sign Structure (S-678)

(a) The Contractor shall carefully remove the cantilever sign structure on the eastbound ramp and store the structure on site for later re-installation on the new pile foundation. The existing pile foundation shall be demolished to 1.0 metres below finished grade and the resulting void shall be backfilled with compacted suitable site fill material. The sign structure shall not be placed on the ground but shall be stored on suitable wood cribbing until such time that it can be reinstalled.

(b) The Contractor shall disassemble the horizontal arm from the vertical member of the structure and replace the stainless steel bolts with galvanized steel bolts.

(c) Once the new pile foundation has been constructed and has gained sufficient strength the structure shall be re-installed on the new foundation at the location indicated on the Drawings. The horizontal arm of the structure shall be reconnected to the vertical member utilizing the galvanized bolts.

E13.3.18 Quality Control

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

(b) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All materials shall be free of surface imperfections and other defects.

E13.4 Measurement and Payment

(a) Overhead sign Pile Foundation concrete shall be paid for at the Contract Unit Price per cubic metre measured as specified herein for “Overhead Sign Pile Foundation” in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) The removal, salvage and relocation of the existing sign structures will be measured on a unit basis and will be paid for at the Contract Unit Price for the units of work noted below. The number of sign structures paid for shall be the total number of structures removed, salvaged and relocated in accordance with this specification, accepted and measured by the Contract Administrator.

(c) Removal, Salvage and Relocation of Overhead Sign Structures

(i) Removal and Salvage of Pole Mount Sign Structure (S-540); and

(ii) Relocation of Cantilever Sign Structure (S-678).

E14. RELOCATION OF PRECAST FRANGIBLE PLANTERS

E14.1 Description

(a) This specification covers the relocation of frangible planters in the boulevard area of Pembina Highway at the existing entry to the overpass ramp and the supply and placement of planting soil in the planters following relocation.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all

things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E14.2 Referenced Standard Construction Specifications

(a) CW 3540 – Topsoil and Finish Grading for the Establishment of Turf Areas

(b) CW 3310 – Portland Cement Concrete Pavement Works

E14.3 Material

E14.3.1 Storage and Handling

(a) All material shall be handled carefully and transported in such a manner so as to ensure the material is not damaged. Any damaged or missing material or components shall be replaced at the Contractor's expense.

E14.3.2 Planter Soil

(a) Planter soil shall conform to the requirements of City of Winnipeg Standard Construction Specification CW 3540, Section 5.2 Topsoil.

E14.3.3 Reinforcing Steel

(a) Reinforcing steel for concrete planter foundations shall conform to the requirements of City of Winnipeg Standard Construction Specification CW 3310, Section 5.4.4 Reinforcing Steel.

E14.3.4 Concrete

(a) Portland Cement Concrete planter foundations shall conform to the requirements of City of Winnipeg Standard Construction Specification CW 3310, Section 6.2 Concrete Strength and Workability for Type 1 Concrete.

E14.4 Construction Methods

(a) The topsoil is to be removed from the existing frangible planters prior to disassembly and relocation. The planters are then to be disassembled in accordance with the manufacturer's instructions and stored for later re-assembly on the newly constructed planter foundation.

(b) Prior to construction of the new median slab, the planter foundations shall be constructed at the locations shown on the drawings. Once the foundations are completed and have gained sufficient strength the frangible planters shall be reassembled on the planter foundations.

(c) Prior to backfilling the planters with topsoil the planters shall be lined with heavy landscape fabric to prevent migration of topsoil through the joints in the planter. The planters shall then be backfilled with topsoil to 100 mm below the top edge of the planter.

E14.5 Measurement and Payment

E14.5.1 Relocation of Frangible Planters

(a) The relocation of precast frangible planters will be measured on a unit basis and will be paid for at the Contract Unit Price for the units of work noted below. The number of planters paid for shall be the total number of planters of each size relocated in accordance with this specification, accepted and measured by the Contract Administrator.

(b) Relocation of Pre-Cast Frangible Planters

(i) Relocation of 1240mm x 1240mm x 900mm Planter

(ii) Relocation of 1240mm x 1240mm x 1350mm Planter

(iii) Relocation of 1800 mm x 1800 mm x 900mm Planter

(c) No separate measurement and payment will be made for removal of the existing topsoil from the planters and the supply and placement of new topsoil and landscape

fabric in the relocated planters, this work will be considered included in the Work of this specification.

E14.5.2 Construction of Planter Foundations

(a) The construction of planter foundations will be measured on a lineal measure basis and will be paid for at the Contract Unit Price per metre for “Construction of Planter Foundations”. The number of metres of planter foundation paid for shall be the total number of metres of planter foundation constructed in accordance with this specification, accepted and measured by the Contract Administrator.

E15. EXPOSING EXISTING UNDERGROUND UTILITIES

E15.1 Description

(a) This specification covers the exposing of existing larger diameter and high pressure gas lines and MTS ductlines prior to roadway excavation for the purpose of determining their actual elevation.

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

E15.2 Material

E15.2.1 Backfill Material

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

E15.3 Construction Methods

E15.3.2 Hydro-Excavation

(a) Prior to any excavation taking place on site in the vicinity of the larger diameter and high pressure gas lines and MTS ductlines, the Contractor shall expose the gas line or ductline in question by hydro-excavating. It is anticipated that there will be thirteen locations where hydro-excavation will be required.

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

E15.3.3 Manitoba Hydro Safety Watch

(a) The Contractor is advised that a safety watch will be required for the entire duration of the hydro-excavation to expose the gas lines and at all times during roadway excavation in the vicinity of the gas lines.

(b) At no time shall excavation of any kind be permitted in the vicinity of the gas lines if Manitoba Hydro safety watch personnel are not present.

(c) Due to heavy workloads during construction season, Manitoba Hydro has advised that a minimum of one week’s notice is required prior to excavation to schedule safety watch personnel.

(d) Costs for Hydro safety watch during hydro-excavation of gas lines and during pavement excavation in the vicinity of gas lines shall be included with the Work of this specification and will be included with the cost of roadway pavement excavation and no further measurement or payment will be made.

E15.4 Measurement and Payment

(a) Hydro-excavation for exposing of larger diameter and high pressure gas lines and MTS ductlines will be measured on a lump sum basis and will be paid for at the Contract Lump

Sum Price for "Exposing Existing Underground Utilities", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E16. PRE-CAST CONCRETE BARRIERS

E16.1 Description

E16.1.1 General

(a) This specification covers the transportation, placement and assembly of pre-cast concrete barriers at the entry to and exit from the transit corridor pavement stubs on the westbound Jubilee Ramp, north of Jubilee Avenue.

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

E16.2 Materials

E16.2.1 Precast Concrete Barriers

(a) The pre-cast concrete barriers will be supplied by the City of Winnipeg Public Works Department and consist of a precast section approximately 450 mm high by 2740 mm long, two steel posts and a barricade style blade that mounts between the posts on top of the precast concrete section.

E16.3 Construction Methods

E16.3.1 Transporting of Pre-cast Barriers

(a) The Contractor shall be responsible for the pickup and delivery of the pre-cast concrete barriers and all applicable components to the site. The Contractor shall supply equipment capable of lifting and loading the barriers at the City yard and safely transporting to, and unloading the barriers at the site. Any damage occurring to the barriers during loading, transporting and unloading shall be repaired at the Contractor's expense.

(b) Prior to leaving the yard the Contractor's personnel shall inspect the barriers in conjunction with City personnel and note any obvious damage. The Contractor shall provide the Contract Administrator with a written description of any damage noted prior to transportation of the barriers.

(c) The barriers are located at the City of Winnipeg Public Works Bridge Yard at 849 Ravelston Ave. W., Contact Mr. Mike Terleski C.E.T., Ph. 794-8510, a minimum of 24 Hours prior to pick up of the barriers. Once the barriers have reached the site they shall be carefully unloaded, placed and assembled at the locations indicated on the drawings.

E16.3.2 Assembly of Barrier Components

(a) Once the concrete section of each barrier has been placed, the Contractor shall assemble the metal pole and barricade sections of the barriers onto the concrete sections. Should there be any missing nuts bolts or washers, the Contractor shall supply new galvanized nuts, bolts and/or washers.

E16.4 Measurement and Payment

(a) Placement of Pre-cast Concrete Barriers will be measured on a unit basis and will be paid for at the Contract Unit Price for "Placement of Pre-cast Concrete Barriers", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E17. STRUCTURAL REMOVAL

E17.1 Description

(a) This Specification shall cover all operations relating to the removal and disposal of miscellaneous existing Bridge and approach roadway components, as specified herein and as shown on the Drawings. This Specification shall cover structural removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, dismantlement, and disposal of applicable materials.

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

E17.2 Scope of Work

(a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator.

(b) This section of Work comprises of the following structural removals:

(i) Removal of existing reinforced concrete median from the east end of the east approach slab to the west end of the west approach slab of the existing Jubilee Overpass.

(ii) Removal of concrete slope and sidewalk required to set up shoring for bearing replacement;

(iii) Removal of all existing bearings at the six (6) per columns;

(iv) Removal of top portions of concrete columns required to install new bearings;

(v) Removal, storage, and re-installation of light fixtures at the six (6) pier columns;

(vi) Removal of the top ±40 mm of the Jubilee Overpass concrete deck by hydro-demolition;

(vii) Removal of the two existing approach slabs;

(viii) Removal of existing reinforced concrete barriers and curbs on the existing Jubilee Overpass;

(ix) Removal of the four abutment wingwalls;

(x) Removal and salvaging of railing and posts on the existing concrete traffic barriers of the Jubilee Overpass.

(c) Removing concrete and other items with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way into the watercourse. No demolition products shall find their way onto the sidewalk or roadway below the overpass. Provide saw cuts as shown on the Drawings and where otherwise necessary to limit the extent of demolition. Repair any over demolition and reinforcing damage to the satisfaction of the Contract Administrator. Penetrating sealer shall be applied to all components three (3) days prior to removal of aluminum Bridge traffic barrier components.

(d) All structural removal materials not identified for salvage shall revert to the Contractor for off-site disposal.

E17.3 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule, clearly illustrating the method and sequence by which he proposes to perform the structural removals, including a description of the measures that will be implemented to meet the environmental requirements. The demolition procedure shall include detailed design notes and Shop Drawings that are sealed, signed, and dated by a

Professional Engineer licensed to practice in the Province of Manitoba necessary to describe the following:

(i) Work platforms;

(ii) Type and capacity of equipment;

(iii) Sequence of operations;

(iv) Design of demolition catch platforms; and

(v) Description of the measures that will be implemented to meet the requirements of D26 – Environmental Protection Plan.

(c) The Contractor shall prepare and submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a plan detailing the Contractor's hydro-demolition runoff control and disposal methods and procedures. Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers, prior to entering the City's land drainage sewer system. Bridge deck drain openings shall be plugged during the hydro-demolition process. At no time can runoff of wastewater be permitted to enter the watercourse or the City's land drainage system unfiltered.

E17.4 Materials

E17.4.1 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.

E17.5 Equipment

E17.5.1 General

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

(b) The use of explosives is prohibited.

E17.5.2 Demolition Catch Platforms and Work Platforms

(a) The Contractor shall provide all necessary access/work platforms to facilitate structural removals and associated inspection of all Works by the Contract Administrator.

E17.6 Construction Methods

E17.6.1 General

(a) Structural removals shall be deemed to include all the items of work as listed under Clause E17.2(b) of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the contract Administrator.

(b) The Contractor shall prevent movement, settlement, or damage of existing structures to remain, services, paving, tress, landscaping and adjacent grades. The contractor shall provide bracing, shoring and underpinning as required and shall have this work certified by a Professional Engineer registered to practice in the Province of Manitoba employed by the General Contractor. If safety of the structure being removed, existing structures or services, appears to be endangered, the contractor shall cease operations and notify the Contract Administrator immediately.

(c) The contractor shall provide flagmen, guards, barricades, railings, and necessary warning lights and whenever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or others construction, to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial

Statutes and applicable to the Work. The contractor shall provide all other protective measures as may be required by any law in force in Manitoba and the Canada Labour Code.

(d) Traffic and pedestrian control shall conform to E8 “Traffic Management” and E9 “Pedestrian Safety.”

(e) Under no circumstances shall the Contractor close any portion of existing roadways or walkways to traffic without prior written approval of the contract Administrator. If any existing roadway is to be closed to traffic in no case shall the Contractor commence any construction operations until such time as all the signs, barricades, and flashers have been erected to the satisfaction of the Contract Administrator.

(f) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.

(g) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on-site will be allowed without written approval of the contract Administrator. It shall be the Contractor’s responsibility to find suitable disposal areas away from the site.

(h) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any roadways or sidewalks during removal operations.

(i) The Contractor shall visit the site to become familiar with the existing conditions and scope of work prior to bid submission. No allowance for extras will be made for any structural removals, not foreseen by the Contractor, required to complete the scope of work.

(j) The details and dimensions of the existing structures shown on the Drawings are for assisting the Contractor in establishing methods and limits of removal and for determining the cost of the Work. All available Drawings for the existing bridge structure and modifications are available for viewing with the Contract Administrator. No guarantee for the accuracy of the information is given. No allowance for extras will be given for information on the Drawings that does not represent existing conditions.

(k) The Contractor shall be responsible for any damage to items for salvaging.

(l) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.

(m) The Contractor shall provide all necessary access/work platforms to facilitate structural removals and subsequent inspection of all the Works by the Contract Administrator.

(n) The Contractor shall be fully responsible for ensuring the public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.

(o) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures. For partial removal of concrete, edges shall be saw-cut to clean and straight lines. Top surface of the bridge deck is to be removed by hydro-demolition.

(p) The Contractor shall only use methods of steel removal that will not damage the existing structure to remain or new structures.

(q) The Contractor is responsible for removing all salvage items and stockpiling at a location within the City of Winnipeg indicated by the Contract Administrator. The contractor shall only sue methods of removal that will not damage the salvage items.

E17.6.2 Removal of Concrete Bridge Barriers, and Curb Overhangs

(a) This Work shall include removal of the concrete barriers and curb overhang.

(b) Removal of the concrete barrier and curb overhang shall be to the limits of removals as shown on the Drawings.

E17.6.3 Removal of Deck Concrete

(a) Concrete removal shall be the removal of the concrete deck slab to a nominal depth of 40 mm measured from the top of the existing concrete deck surface. The minimum removal depth shall be 25 mm and the maximum removal depth shall be 75 mm where deteriorated concrete exists.

(b) Concrete removal shall be undertaken by hydro-demolition.

(c) Following the initial removal of concrete, the Contract Administrator shall conduct a delamination survey to determine if any additional concrete removal will be required. These areas will be clearly marked out on the deck surface for the Contractor by the Contact Administrator.

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

E17.6.4 Bridge Deck Surface Preparation Works

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

(i) For vertical surfaces, concrete shall be removed by hydro-demolition to a “Medium Scarification” profile, in accordance with the ICRI Guideline No. 03732, CSP6. For horizontal surfaces, concrete shall be removed by hydro-demolition to a “Scabbled” profile, in accordance with the ICRI Guideline 03732 CSP8.

(b) Prior to the commencement of the removal operation by hydro-demolition, the hydro-demolition equipment shall be calibrated on an area of sound concrete approximately 600 x 1500, as directed by the Contract Administrator. The cost of the calibration procedure is incidental to the Work. The Contractor shall provide the Contract Administrator with the following settings:

(i) Water pressure;

(ii) Machine staging control (step);

(iii) Nozzle size; and

(iv) Nozzle speed.

(c) During the calibration, any or all of the above settings may be adjusted in order to achieve removal in accordance with the requirements of the Drawings. When the designated depth of removal is attained, the settings shall be recorded and maintained throughout the removal operation unless otherwise directed by the Contract Administrator. The depth of removal shall be verified periodically and, if necessary, the equipment recalibrated to ensure the depth of removal as indicated on the Drawings is achieved.

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

(e) Where applicable, any “shadowing” of the reinforcing steel by concrete not removed by the process of hydro-demolition shall be removed by the Contractor through other approved means.

(f) After the hydro-demolition is completed, the deck surface shall be inspected through methods of sounding by the Contract Administrator to ensure that all partial depth deteriorated concrete has been removed. Should deteriorated concrete be found, the Contractor shall remove the areas of deteriorated concrete by additional passes of the hydro-demolition equipment or jackhammers. Payment for removal of these areas shall be considered as part of concrete removals.

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

(h) There is a possibility that during hydro-demolition blow-throughs to the deck voids may occur. Since it is difficult to predict when or even if a blow-through will occur, the following contingency plan shall be undertaken by the Contractor for this eventuality:

(i) In instances where a blow-through of the Bridge deck does occur, the Contractor will be required to halt the water jet immediately and stop the flow of water and deck solids. The latter may be accomplished by immediately placing sandbags in the location of the blow-through opening. Sandbags shall be supplied on standby by the Contractor for just such an occurrence.

E17.6.5 Screed Survey

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

(b) The Contract Administrator shall provide the final screed elevations for the new deck slab concrete.

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

E17.6.6 Removal of Approach Slabs

(a) The demolition of the approach slabs shall be conducted to the limits shown on the Drawings.

E17.6.7 Removal of Existing Bearings

(a) The Contractor shall provide jacking and shoring system to raise and support the bridge at the pier columns prior to removing the existing bearings.

(b) All of the existing bearings at the six (6) pier columns shall be removed to the limits shown on the Drawings.

E17.6.8 Removal of Top Portion of Pier Columns

(a) The top portion of the existing pier columns shall be removed by cutting to the limits show on the Drawings.

E17.7 Quality Control

E17.7.1 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.

E17.7.2 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.

E17.8 Measurement and Payment

(a) Removal of the existing median on the overpass and on the approach slabs will be not be measured. This item of work will be paid for at the Contract Lump Sum Price for “Removal of Existing Median.” The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.

(b) Removal of concrete slope pavement and sidewalk (required to set up shoring for bearing replacement) will be considered incidental to the Bearing Replacement Works. It will be not be measured or separately paid for.

(c) Removal of all existing bearings at the six (6) per columns will be considered incidental to the Bearing Replacement Works. It will be not be measured or separately paid for.

(d) Removal of top portions of concrete columns (required to install new bearings) will be considered incidental to the Bearing Replacement Works. It will be not be measured or separately paid for.

(e) Removal, storage, and re-installation of light fixtures at the six (6) pier columns will be considered incidental to the Bearing Replacement Works. It will be not be measured or separately paid for.

(f) Removal of the top ±40 mm of the Jubilee Overpass concrete deck by hydro-demolition will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for ”Removal of Concrete Deck by Hydro-demolition,” which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(g) Removal of the two existing approach slabs will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for ”Removal of Approach Slabs,” which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(h) Removal of existing reinforced concrete barriers and curbs on the existing Jubilee Overpass will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for “Removal of Existing Barrier Curb.” The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.

(i) Removal of the four wingwalls will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for ”Removal of Wingwalls,” which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(j) Removal and salvaging of railing and posts on the existing traffic barriers of the Jubilee Overpass will be measured on a lineal meter basis and paid for at the Contract Unit Price per linear meter for “Removal and Salvaging of Existing Barrier Railing.” The length to be paid for will be the total number of linear meters of along the centreline of the barrier railing from end to end as shown on the drawings and as accepted by the Contract Administrator. The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.

(k) Bridge deck surface preparation shall not be measured. This item of Work shall be considered incidental to the removal of concrete deck by hydro-demolition.

E18. POST-TENSIONED CABLE BREAK DETECTION

E18.1 Description

(a) This specification covers all operations related to the post-tensioned cable break detection in the deck structure of the Jubilee Overpass.

(b) The Works include cable break detection scanning for the thirty one (31) longitudinal tendons between the two existing barrier curbs. The scanning extent for each tendon at each pier region will be from 4000 mm left to 4000 mm right of each pier centerline, i.e. 16000 mm scanning length for each tendon.

(c) The Works also include cable break detection scanning for the twelve (12) transverse tendons, i.e. six (6) at each pier region. The scanning extent for each transverse tendon will be as follows:

(i) 2000 mm from face of south barrier curb

(ii) 4000 mm left to 4000 mm right of each central column

(iii) 2000 mm from face of north barrier curb

(d) Each longitudinal tendon consists of twelve (12) – 15 mm diameter strands.

(e) Each transverse tendon consists of seven (7) – 15 mm diameter strands.

(f) The Works include the interpretation of the scanning data and submittal of the cable break detection report.

(g) The Work to be done by the Contractor under this Specification includes 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 Equipment

(a) Post-Tech PT Cable Break Detection system by Vector Corrosion Technologies or approved equals.

(b) The system must be capable of identifying and locating breaks and small fractures in prestressed and post-tensioned cables. The detection capability of the system must not be affected by the presence of metal duct sheathing.

E18.3 Construction Methods

(a) Engage Vector Corrosion Technology (or a qualified service provider of an approved equal PT cable break detection system) to perform the Works in this section.

(b) Ensure that the removal of the median is done prior to the commencing of the cable break scanning work.

(c) Coordinate with other works so that they will not affect the cable break scanning results.

(d) Obtain the cable break detection report and submit it to the Contract Administrator.

E18.4 Measurement and Payment

(a) The Works covered under this section will not be measured.

(b) The Works will be paid for at the Contract Lump Sum Price for ”Post-Tensioned Cable Break Detection,” which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E19. EXCAVATION AND BACKFILLING

E19.1 Description

(a) The Works in this section include the following:

(i) Excavation and backfilling required to construct the deck extensions, wingwalls, and approach slabs at the two ends of the Jubilee Overpass.

(ii) Supplying and installation of perforated and non-perforated drain pipe with crushed rock wrapped in filter fabric to provide subsurface drainage behind each abutment.

(iii) Excavation required to set up the shoring frames for bearing replacement and the backfilling after shoring frame removal.

(iv) Excavation and backfilling required to construct the mechanically stabilized earth (MSE) wall as shown on the drawings.

(v) Excavation and backfilling required to construct the pile foundation overhead sign structure.

(b) The Works also include the following:

(i) The design, fabrication, erection, and removal of all temporary shoring, and such temporary protective measures as may be required to construct the Works.

(ii) The off-site disposal of surplus and unsuitable material.

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

E19.2 Equipment

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

E19.3 Materials

E19.3.1 Excavation

(a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator.

(b) All excavated materials shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the Owner for any materials taken by the Contract Administrator for testing purposes.

(c) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, earth, gravel, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, or all other material of whatever character which may be encountered.

E19.3.2 Backfilling

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the Owner for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall be accepted by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

(c) Backfill materials shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Backfill shall not be placed on frozen subsoil.

(d) All granular backfill, including levelling base fill, shall be clean and free from organic material, meeting the following gradation requirements:

CANADIAN METRIC SIEVE SIZE	PERCENT PASSING BY WEIGHT
50 000	100
20 000	75 - 100
5 000	45 - 85
2 500	35 - 55
315	15 - 35
160	5 - 20
80	0 - 7

(e) Clay backfill for structures shall be of a type accepted by the Contract Administrator, preferably native material if deemed suitable by the Contract Administrator.

(f) Excavated material may be used for backfilling provided it meets the above requirements. Excavated granular material intended to be used for backfilling is not be contaminated by top soil or organic materials.

(g) Backfilling for MSE wall construction shall meet the requirements stated in that section of the Specification.

E19.3.3 Galvanized Corrugated Steel Drain Pipe

(a) Perforated drain pipe shall be 150 mm diameter, 1.3 mm core thickness galvanized corrugated steel drain pipe with six (6) rows of 10 mm diameter perforations as manufactured by Armtec or approved equal.

(b) Non-perforated drain pipe shall be 150 mm diameter, 1.3 mm core thickness galvanized corrugated steel drain pipe as manufactured by Armtec or approved equal.

E19.3.4 Non-Woven Geotextile, Class 1

(a) Armtec 150 as manufactured by Mirafi Construction Products or approved equal.

E19.4 Construction Methods

E19.4.1 Excavation

(a) Excavations shall be completed to the elevations required to construct the Works or to such other elevations as may be directed by the Contract Administrator in the field. Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of the excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

(b) All material shall be brought to the surface by approved method, and shall be disposed of away from the site.

(c) After each excavation is completed, the Contractor shall notify the Contract Administrator.

(d) The Contractor shall excavate only material that is necessary for the expeditious construction of the structure or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of runways, existing stock piling, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at his own expense and as directed by the Contract Administrator.

(e) All excess excavated material shall become the property of the Contractor and shall be removed from the site.

E19.4.2 Backfilling

(a) The Contract Administrator shall be notified at least one (1) working day in advance of any backfilling operations. No backfill shall be placed against any concrete until accepted by the Contract Administrator.

(b) All backfill material shall be supplied, placed, and compacted in lifts of 150 mm (maximum) to a minimum of 95% of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time.

(c) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

(d) The Standard Proctor Density for granular and clay backfill material shall be determined at the optimum moisture content in accordance with standard laboratory Proctor Compaction Test Procedure.

(e) The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard, Test for Density of Soil in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.

(f) The frequency and number of tests to be made shall be as determined by the Contract Administrator.

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

(h) The Contract Administrator shall be afforded full access for the inspection and control testing of constituent materials both at the site of the Work and at any plant used for production of the materials to determine whether the material is being supplied and placed in accordance with this Specification.

(i) Any backfill material that does not meet the gradation and/or compaction requirements of this Specification shall be removed and replaced by the Contractor at his own expense, to the satisfaction of the Contract Administrator.

E19.4.3 Galvanized Corrugated Steel Drain Pipe Installation

(a) Install perforated drain pipe, with perforations facing down, for the full length of the deck extensions at each end of the overpass. This shall be centred on the 450 x 450 mm crushed drainage stone as shown on the Drawings.

(b) Install non-perforated drain pipe beyond the deck extensions straight in line with the perforated drain pipe. This shall extend south until it daylights through the embankment. Backfill around this pipe shall be compacted suitable site material.

E19.4.4 Installation of Non-Woven Geotextile, Class 1

(a) The non-woven geotextile, Class 1, shall be installed around the 450 x 450 mm crushed drainage stone as shown on the Drawings and shall overlap a minimum of 150 mm at all seams.

E19.5 Measurement and Payment

(a) The excavation required for setting up shoring frames (for the bearing replacement work) and the backfilling after shoring removal will not be measured. They will be considered incidental to “Bearing Replacement” and will not be separately paid for.

(b) The excavation and backfilling required for the construction of deck extensions, approach slabs, and wingwalls will not be measured. They will be paid for at the Contract Lump Sum Price for ”Excavation and Backfilling for Deck Extension Construction,” which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(c) The excavation and backfilling required for the construction of MSE retaining wall will not be measured. They will be considered incidental to "MSE Retaining Wall" and will not be separately paid for.

(d) The excavation and backfilling required to construct the pile foundation for the relocated overhead sign structure will not be measured. They will be considered incidental to "Supplying and Placing Structural Concrete – Overhead Sign Pile Foundation" and will not be separately paid for.

E20. BEARING REPLACEMENT

E20.1 Descriptions

(a) This Specification covers the supply, fabrication and installation of six (6) guided pot bearings and their connection assemblies as shown on the Drawing to replace the existing bearings for the Jubilee Overpass.

(b) The Works for this section also include jacking and shoring of the overpass at the two interior piers to remove the existing bearings.

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

E20.2 References

(a) CSA-B95-1962(R1996) Surface Texture (Roughness, Waviness and Lay)

(b) CAS-G40.20/40.21-98 General Requirements for Rolled or Welded Structural Steel /Structural Quality Steel

(c) CSA-G164-M92 (R1998) Hot Dip Galvanizing of Irregularly Shaped Articles

(d) CSA-W48-01 Filler Metals and Allied Materials for Metal Arc Welding

(e) CSA-W59-M1989 (R2001) Welded Steel Construction (metal Arc Welding) (Metric Version)

(f) CSA-S6-06 Canadian Highway Bridge Design Code

(g) ASTM A 240/A 240M-03b Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels

(h) ASTM A 325-02 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

E20.3 Materials

E20.3.1 Pot Bearings

(a) Guided Bearing by GOODCO Z-TECH or approved equals.

(b) Bearing materials, manufacture, fabrication and installation shall comply with CAN/CSA-S6-06 for pot bearings.

(c) All materials shall be new and unused with no reclaimed material incorporated in the finished bearing.

(d) The Contractor shall furnish a manufacturer's certification that materials proposed for use on the project have been pre tested and will meet the requirements as set forth in the manufacturer's current literature.

(e) Elastomer and rubber components shall meet Grade 5 classification as per CAN/CSA-S6.

(f) Sliding pot bearing shall have a PTFE and stainless steel interface.

E20.3.2 Manufacturing

(a) Bearings shall be factory set and clamped for equal expansion and contraction and plant assembled.

(b) Temporary connections shall not be removed until the bearings are set in their final positions.

(c) The stainless steel sliding surface interface sheet shall conform to ASTM A240/A240M and continuously welded to the top plate. The roughness of the contact surface shall be measured in accordance with CSA B95 and shall not be greater than 0.25 mm arithmetic average.

(d) All pot bearings shall have a minimum rotational capacity of + 0.02 radians. All elements shall be capable of maintaining its initial uniform contact at + 0.02 radians rotation. The coefficient of friction between the PTFE and stainless steel plates at maximum permissible bearing load shall be 0.03 or less. PTFE for pot bearings are to be lubricated and unfilled. Exposed steel surface shall be zinc metalized.

(e) The bearing device manufacturer shall be pre-qualified with a five year proven history of successful product manufacture.

(f) All welding shall be in accordance with CSA W59-M. The company undertaking welding fabrication shall be certified in Division 1 or Division 2.1 of CSA W47.1. All welding shall be done with electrodes certified by the Canadian Welding Bureau to the requirements of CSA W48.

(g) Unidirectional or constrained sliding bearings should be manufactured with a gap tolerance at the guides of 0.5 mm.

(h) All bearing surfaces of steel plates shall be finished flat within 0.25 mm. Overall manufacturing height tolerance shall be + 3 mm.

(i) Connections shall be designed and supplied by the fabricator for the maximum horizontal force and minimum/maximum vertical force indicated on the drawings.

(j) All bearings shall be indelibly marked with the name of the manufacturer, the part number, bearing identification number, elastomer type, elastomer grade and the date of manufacture on the side visible after erection.

E20.3.3 Steel Plates and Bars

(a) Steel plates and bars where shown on the Drawings shall conform to the requirements of CSA Specification G40.21-98 Grade 300@ and shall be galvanized after fabrication in accordance with CSA G164-M92 for a minimum retention of 600 g/m2.

E20.3.4 Bolts, Fasteners, Washers and Nuts

(a) Bolts, nuts and washers requires for the bearing installation shall conform to the requirements of ASTM Specification A325. Nuts shall conform to the requirement of ASTM Specification A563, Grade C. Washers shall conform to the requirements of ASTM Specification F436, Type 1. Bolts, fasteners, washers and nuts shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a minimum retention of 600 g/m2.

E20.3.5 Welding Consumables

(a) Welding consumables for all processes shall be certified by the manufacturer as complying with the requirement of CSA Standard W59-M1989 and the following specifications:

(i) Manual shielded metal-arc welding (SMAW):

(i) All electrodes for the manual, shielded metal-arc welding process shall conform to CSA W48. 1-M1991, CSA @48.3-93 classification E480XX or imperial equivalent.

(ii) Gas, Metal Arc Welding (GMAW):

(i) All electrodes used in the gas, metal arc-welding process shall be composite electrodes conforming to CSA @48.4-95 classification ER480S-X or imperial equivalent.

(iii) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.

(iv) Submerged Arc Welding (SAW):

(i) Welding electrodes and fluxes used in the submerged arc welding process shall conform to CSA W48.6-1996 classification F480X-EXXX or imperial equivalent.

(v) All electrodes, wires and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -30°C as outlined in the various codes mentioned above.

(b) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for his acceptance at least twenty-one (21) days prior to the scheduled commencement of any fabrication.

(c) In multiple pass welds, the weld may be deposited such that at least two layers on all surfaces and edges are deposited with one of the filler metals listed above for each particular welding process, provided the underlying layers are deposited with one of the filler metals specified in CSA Standard W59.

E20.3.6 Galvanizing Touch-up and Field-Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metalizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-01 (2006) for “Repair of Damaged Hot-Dip Galvanized Coatings.”

(b) Approved products are:

(ii) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and

(iii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocoate Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E20.3.7 Mortar and Grout

(a) Materials for mortar and grout shall conform to the requirements of the grading of CAN/CSA A23.1-04. The grading of sand for use in grout or for use in mortar when the width or depth of the void to be filled is less than 20 mm shall be modified so that all material passes the No. 8 (Imperial) sieve.

(b) Unless otherwise specified, the proportion of cement to sand for mortar shall be one to two and for grout shall be one to one. Proportioning shall be by loose volume.

(c) When non-shrink mortar or grout is specified, either a non-shrink admixture or an expansive hydraulic cement conforming to ASTM C 845 of a type approved by the Engineer, shall be used.

(d) Only sufficient water shall be used to permit placing and packing. For mortar, only enough water shall be used so that the mortar will form a ball when squeezed gently in the hand.

(e) Mixing shall be done by either hand methods or with rotating paddle type mixing machines and shall be continued until all ingredients are thoroughly mixed. Once mixed, mortar or grout shall not be re tempered by the addition of water and shall be placed within one hour.

E20.3.8 Miscellaneous Materials

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

E20.4 Submittals

(a) The Contractor shall notify the Contract Administrator of the name and address of the supplier of the bearings within 30 days of the Contract award.

(b) All bearing shop drawings shall bear the seal and signature of an Engineer. All jacking and shoring shop drawings procedures and design calculations shall bear the seal and signature of the design and checking Engineers.

(c) The Contractor shall provide the detailed design calculations for the pot bearings, showing that the stability, stresses on PTFE and rotational capacities meet the requirements of this Specification.

(d) The following information is required regarding the bearings:

(i) Dimensions of each component including: top plate, sliding surface, bearing surface, piston, elastomeric disc, base pot, anchor bolts, welds and the overall dimensions of the finished bearing;

(ii) Minimum and maximum horizontal and vertical load capacity, both SLS and ULS;

(iii) Longitudinal and transverse movement capacity;

(iv) Bearing rotation capacity in radians;

(v) Sketch indicating bearing locations, orientation and movement;

(vi) The Shop Drawings shall contain a detailed bill of materials;

(vii) Installation details;

(viii) Method of attachment of bearings to the top and bottom plates; and

(ix) All additional plates shown on the Drawings.

E20.5 Construction Methods

E20.5.1 General

(a) All welding within 3 m of any bearing shall be specifically prohibited unless written approval is obtained from the Engineer. Such approval will require specific measures to protect the bearings where so required by the Engineer.

E20.5.2 Jacking and Shoring for Bearing Removal

(a) Engage a professional engineer, registered in the Province of Manitoba, to conduct the jacking and shoring design for the purpose of bearing removal and replacement. The design parameters are as shown on the drawings.

(b) Erect shoring / jacking frames per the design.

E20.5.3 Pot Bearings

(a) The manufacturer shall ship each bearing fully assembled. The bearings are not to be disassembled prior to final installation without the knowledge of the design authority and manufacturer.

(b) Bearings when received on site shall be unloaded and stored in accordance with the manufacturer's recommendations.

(c) The bearings shall be installed in the location and orientation as indicated on the Contract Drawings. Constrained sliding or unidirectional bearings shall be properly aligned to allow for the movement of the structure as indicated on the Contract Drawings. The bearings shall not be installed in the field prior to the approval from the Contract Administrator.

(d) The Contractor shall establish the bearing alignment using surveying instruments. The tolerance for variation in alignment, i.e. plan view, is + 0.0067 radians (0.382 degrees) where the bearing is required to move 75 mm or less. The bearings shall have dead level bearing surfaces, i.e. top and bottom plates. Dead level shall be defined as + 0.001745 radians (0.10 degrees), i.e. + 1.745 mm in 1,000 mm.

(e) In positioning, the bearing centre of the base should correspond to the centre of the support.

(f) The base plate shall be bedded by the Contractor on non-shrink grout. It is of extreme importance that the final bedding be free from high or hard spots, voids, etc. The Contractor shall supply durable load bearing wedges to support all bearings when

they are placed on the non-shrink grout pad. Wooden wedges are not acceptable. The bearing base plate shall be set in position using a flowable non-shrink grout unless otherwise indicated on the Shop Drawings. Installation requirements shall be written on the Shop Drawings. Bearings are to be installed as per the manufacturer's recommendations.

(g) Concrete areas to be in contact with the mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond and the concrete surfaces and shall be flushed with water and allowed to dry to a surface dry condition immediately prior to placing the mortar or grout.

(h) The mortar or grout shall completely fill and shall be tightly packed under the bearing masonry plates. After placing, all surfaces of mortar or grout shall be cured by the water method for a period of not less than 3 days.

(i) No load shall be allowed on mortar that has been in place less than 72 hours, unless otherwise permitted by the Contract Administrator.

(j) All improperly cured or otherwise defective mortar or grout shall be removed and replaced by the Contractor at his or her expense.

E20.5.4 Welding

(a) All welding shall conform to the requirements of CSA Standard W59.1.

(b) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material by commercial sand, grit or shop blasting or pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting or pickling.

E20.5.5 Installation of Bearing Assemblies on Pier Columns

(a) The Contractor shall verify the condition of the bearing supplied to site during installation. The bearings shall be properly protected from damage or distortion.

(b) Bearings shall be installed according to the details shown on the Drawings.

(c) After positioning and adjustment of the bearing assemblies has been completed the superstructure shall be lowered onto the bearings. The bearing bottom plates shall be level before any load is transferred to the bearings.

E20.5.6 Galvanizing Touch-Up

(a) Any areas of damaged galvanizing, metalizing, and field welds are to receive field applied galvanizing.

(b) Surfaces to receive field-applied galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. Preheat the surface to 315○C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400○C and to not apply direct flame to the alloy rods.

E20.5.7 Fabrication Guarantee

(a) Before final acceptance of the bearings by the Contract Administrator, the bearing supplier (fabricator) shall provide the City with a written guarantee stating that they will perform satisfactorily for a period of five (5) years from the issuance of the Final Certificate. A representative of the bearing supplier shall inspect the bearing installation on site to ensure that the bearings have been properly installed. The supplier shall state that they have reviewed the installation procedures and find them in accordance with their recommendations. The supplier shall guarantee the replacement of the bearings at his cost in the event that the bearings do not perform satisfactorily.

E20.5.8 Installation Guarantee

(a) The Contractor shall ensure that the bearings are installed in such a manner that will not void the fabricator's guarantee.

E20.6 Measurement and Payment

(a) Each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, location of installation in the structure or source of manufacture, measurement for payment purposes shall be the total number of such units installed.

(b) The Works in this section will be measured on a unit basis. Payment at the contract price for "Bearing Replacement" shall be full compensation for all labour, equipment, materials, plant and services required to supply, fabricate, transport to the job site, store on site, handle and install the bearings in the specified locations. Any anchorages, grout and dowel pins required are considered incidental and no separate payments will be made.

(c) Jacking and shoring works required to conduct the bearing replacement will be considered incidental to the Works and will not be measured or separately paid for.

(d) The concrete work required for the reconstruction of each column top (to seat the new bearing) will also be considered incidental to the Works and will not be measured or separately paid for.

(e) Any necessary engineering and adjustment shall be considered incidental to the Work.

(f) No payment will be made until a certificate of compliance from the Contractor has been received by the Contract Administrator.

E21. PIER COLUMNS - CORROSION PROTECTION

E21.1 Description

(a) The Works in this section include the following:

(i) Spalling and delamination repairs of the six (6) pier columns

(ii) Designing, supplying, and installation of activated arc spray zinc onto concrete pier columns to provide corrosion protection for those columns

(iii) Supplying and application of coating to the columns

(b) Activated arc spray zinc is used to provide galvanic corrosion protection to reinforced concrete structures. The system is applied to concrete surfaces and connected electrically to the embedded reinforcing steel. Once installed, the zinc anode corrodes preferentially to the surrounding rebar, thereby providing galvanic corrosion control or cathodic protection to the adjacent reinforcing steel.

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

E21.2 References

(a) ACI 222R Protection of Metals in Concrete Against Corrosion

(b) ASTM B6 Standard Specification for Zinc

(c) ICRI 03732 Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

E21.3 Submittals

(a) Submit qualifications of National Association of Corrosion Engineers (NACE) – certified Cathodic Protection Technician and certified Cathodic Protection Specialist employed by the corrosion mitigation system technology company. Qualifications shall include a copy of NACE certifications and documentation verifying experience in the installation and testing of galvanic protection systems for reinforced concrete structures.

(b) Submit installation plan including details on installation of the activated arc spray zinc, means and methods for rebar and anode connections, and means and methods for testing and correction of electrical discontinuities. Installation plan shall include separate details for monitored locations if required.

(c) Colour palette sheet of proposed coating

E21.4 Materials

E21.4.1 General

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

(b) All materials supplied under this Specification shall be subject to inspection and approved by the Contract Administrator.

(c) The zinc spray shall be Galvanode ASZ+ humectants-activated metalized zinc coating system by Vector Corrosion Technologies, Winnipeg, MB (2304) 489-6300, www.vector-corrosion.com or equivalent as approved by the Contract Administrator.

E21.4.2 Thermal Spray Zinc Wire

(a) The thermal spray zinc wire shall be 5 mm (3/16") diameter Plattzinc 99.99% pure zinc wire as manufactured by the Platt Brothers & Company, or equivalent as approved by the Contract Administrator. The zinc wire shall be in compliance with ASTM B6 Special high Grade (Z13001) with impurities not to exceed limits established in ASTM B833-01A-2001, Specification for Zinc Wire.

(b) The Contractor shall submit mill certificates for the zinc spray wire to the Contract Administrator for review at least five (5) working days before the start of zinc spray application.

(c) Zinc wire shall be stored in accordance with the manufacturer's recommendations.

E21.4.3 Blasting Abrasive

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

E21.4.4 Humectant

(a) Humectant shall be Galvanode Humectant activator solution or equivalent as approved by the Contract Administrator. Humectant shall be a c00 g/L aqueous lithium bromide solution (LiBr) containing 10 ml/L surfactant, or equivalent as approved by the Contract Administrator.

E21.4.5 Concrete Repair Materials

(a) Concrete repair materials shall be compatible with the galvanic anode system as approved by the anode manufacturer. Compatible repair materials shall be pre-packaged hydraulic-cement based mortar or concrete with 28-day moist cured electrical resistivity less than 15,000 ohm-cm.

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

(c) The concrete repair mortar shall be a shrinkage compensated, fibre reinforced product suitable for application by hand trowelling, or spraying, or form and pour, or pump. The motor product shall be EMACO S88 CI for trowelling or spraying or EMACO S66 CI for form and pour or pump by Masterbuilders or equivalent as approved by the Contract Administrator. Mix in accordance with Manufacturer's Specifications, including additional of aggregate for deep repairs.

E21.4.6 Coating

(a) Decadex by Plastic Concrete (Sika) Concrete Colour - compatible with activated arc sprayed zinc anode.

E21.5 Equipment

E21.5.1 Equipment shall be portable electric arc type specifically designed for application of metalized zinc coatings using 5 mm (3/16") diameter high purity zinc wire, or equivalent as approved by the Contract Administrator.

E21.5.2 Equipment operation shall be performed by personnel with verifiable experience on projects of similar size and scope. The contractor shall submit qualifications of personnel to the Contract Administrator for review at least five (5) working days before the start of zinc spray application.

E21.6 Construction methods

E21.6.1 Manufacturer Technical Assistance

(a) The contractor shall enlist and pay for a NACE-qualified Cathodic Protection Specialist employed by the corrosion mitigation technology company to provide the design of the cathodic protection system to be used.

(b) The contractor shall enlist and pay for a NACE-qualified Cathodic Protection Technician working under the direction of a NACE-qualified Cathodic Protection Specialist and employed by the corrosion mitigation technology company who shall provide technical site support during the installation of the galvanic protection system. The Cathodic Protection Technician shall develop and oversee QA/QC procedures for the installation of the galvanic system approved by the Cathodic Protection Specialist. The Cathodic Protection Technician and Cathodic Protection Specialist shall have verifiable experience in the installation and testing of galvanic protection systems for reinforced concrete structures.

(c) The Work shall be coordinated with the designated Cathodic Protection Technician to allow for site support during project start-up and initial anode installation. The technician shall provide training and support for development of application procedures, quality control program, surface preparation, anode installation, reinforcing steel connection procedures, and electrical continuity verification of embedded reinforcing steel.

E21.6.2 Electrical Continuity

(a) All the vertical reinforcing steel shall be tested for electrical continuity. Connect the test leads to clean reinforcing steel. A voltage difference between the locations of less than 1.0 mV shall be considered confirmation of electrical continuity.

(b) In situations where continuity is not confirmed, re-establish continuity by tying reinforcing together with steel tie wire or by other approved means.

E21.6.3 Surface Preparation

(a) All oil and grease shall be removed from the concrete before any blast cleaning or thermal spray application is carried out. All loose, cracked, or delaminated concrete shall be removed prior to blast cleaning. The Contractor shall allow twenty-eight (28) days curing time of the concrete repair areas prior to application of Activated Arc Spray Zinc.

(b) The concrete surface shall be blast cleaned in accordance with SSPC-Sp 13/NACE No. 6, Surface Preparation of Concrete. The blast cleaning shall remove all contaminates, corrosion products, laitance, and weak concrete. The blast cleaning shall provide a sound concrete surface for the zinc coating to bond to.

(c) Exposed reinforcing bars shall be cleaned to SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning.

(d) The concrete shall be clean, dry and dust free prior to application of the zinc coating. The ambient air temperature and the concrete substrate temperature shall be a minimum of 5○C before applying the zinc coating.

(e) Smooth concrete surfaces are preferred. Maximum surface roughness should be less than or equivalent to ICRI Concrete Surface Profile CSP 6 (Medium Scarification).

E21.6.4 Zinc Spraying

(a) Apply the zinc to the surface of dry, prepared, concrete using multiple 3 to 4 mil thick passes with passes applied at 90○ to each other until a nominal thickness of 381 µm (15 mils) is achieved.

(b) Rebar connection by drill and tap into chipped and exposed rebar. Use 6 mm (1/4") stainless steel threaded rod for the connection. Connections shall receive a coat of 100% solids, non-conductive epoxy such that no part of the connection will be in contact with the concrete when patching is complete. The contractor shall verify continuity between the connections and the ties prior to coating with epoxy. The exposed area will be patched back.

(c) Install a 100 mm x 100 mm (4 in x 4 in) flattened expanded zinc mesh plate at each rebar connection. Zinc plate shall be bolted to the surface over the threaded rebar connections using galvanized steel nuts and galvanized washers.

(d) After the plate is tightened in place, an additional layer of zinc is applied at 381 µm (15 mils) thickness over the connection and the zinc mesh plate. Coating shall extend a minimum of 150 mm (6 in) beyond the edge of the plate in all directions.

E21.6.5 Humectant

(a) After the zinc coating is installed in each area, apply humectants solution to the surface of the zinc coating by spray in a minimum of two coats, or as specified by the manufacturer. Each coat shall be applied and allowed to dry prior to the application of subsequent coats. Coats shall continue to be applied until the total quantity of activator solution applied is 0.1 litre/m2 (0.26 gal/100 ft2), or as specified by the manufacturer.

E21.6.6 Coating

(a) Coatings applied to the zinc and concrete surface should be compatible with the surface applied zinc sheet anode.

(b) Apply coating to each column from the bottom end (tie-beam to column interface) to the column top.

E21.6.7 Preparation for Spalling and Delamination Repairs

(a) Remove all lose and deteriorate concrete to sound concrete from the surface of the concrete.

(b) Following the completion of concrete removals, the contractor shall notify the Contract Administrator to inspect the Work. All resulting concrete and reinforcing steel surfaces shall be thoroughly cleaned by gritblasting. All gritblast materials shall be blown out of the repair area, cleaned up, and removed off and away from the site.

(c) All rusted steel shall be chased until rust is not evident on reinforcing steel. Once the limits of each repair area is identified, saw cut a square perimeter around the patch to a minimum edge depth of 25 mm. Do not cut or damage existing reinforcing steel.

(d) Additional reinforcing steel, if required, shall be installed as directed by the Contract Administrator. Concrete shall be removed al least 50 mm behind all exposed rebar.

(e) If recommended by the mortar/grout Manufacturer's directions, pre-wet the patched surfaces for the duration recommended.

E21.6.8 Repair Pier Column Concrete

(a) Place concrete repair mortar or standard concrete if minimum formed dimensions permit.

(b) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates. This may be done by either the application of a suitable bonding agent or grout or by using a self-bonding mortar or concrete. Place mortar or

concrete by trowelling, pumping, spraying, or into forms ensuring that all entrapped air is removed.

(c) The Contract Administrator shall inspect all repaired areas for bond using a hammer "sounding" method after form removal.

E21.6.9 General Curing of Pier Column Repairs

(a) Unformed concrete surfaces shall be covered and kept moist by means of wet curing blankets for seven (7) consecutive days immediately following finishing operations, or as otherwise approved by the Contract Administrator, and shall be maintained at above 10○C for at least seven (7) consecutive days thereafter.

(b) The use of curing compound will not be allowed on concrete areas that are to receive activated arc spray zinc.

(c) After completing the finishing of unformed surfaces, where curing compound is not permitted, the surfaces shall be promptly covered with a minimum of a single layer of clean, damp curing blanket and 6 mil polyethylene.

E21.7 Testing

E21.7.1 Coating Thickness

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

E21.8 Quality Control

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

(b) A NACE-qualified Cathodic Protection Technician working under the direction of a NACE-qualified Cathodic Protection Specialist and employed by the activated zinc metalizing Technology Company shall provide technical site support during the installation of the galvanic protection system. The Cathodic Protection Technician shall develop and oversees QA/QC procedures for the installation of the galvanic system approved by the Cathodic Protection Specialist. The Cathodic Protection Technician and Cathodic Protection Specialist shall have verifiable experience in the installation and testing of galvanic protection systems for reinforced concrete structures.

(c) The Work shall be coordinated with the designated Cathodic Protection Technician to allow for site support during project start-up and initial anode installation. The technician shall provide training and support for development of application procedures, quality control program, surface preparation, anode installation, reinforcing steel connection procedures, and electrical continuity verification of embedded reinforcing steel.

(d) The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of the Specification.

E21.9 Measurement and Payment

(a) The Works covered under this section will not be measured.

(b) The Works will be paid for at the Contract Lump Sum Price for "Pier Columns Corrosion Protection," which price will be payment in full for supplying all materials/ equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E22. BRIDGE DECK - CORROSION PROTECTION

E22.1 Description

(a) The Work under this section consists of designing, supplying, installing, and energizing a zinc-based galvanic corrosion protection system, including required electrical connections, materials, testing, and ensuring continuity of the reinforcing steel to all elements as outlined in the construction drawings.

(b) The Works also include designing, supplying, and installation of a monitoring system to check the activeness of the protection system in terms of polarization potential and current density.

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

E22.2 References

(a) ACI 222R (2001) Protection of Metals in Concrete Against Corrosion

(b) ASTM B6 Standard Specification for Zinc

(c) ASTM B69 (2001) Standard Specification for Rolled Zinc

(d) ASTM B418 Standard Specification for Cast and Wrought Galvanic Zinc Anodes

(e) SSPC-10 (1994) Near-White Blast Cleaning

E22.3 Submittals

(a) Shop drawings showing typical galvanic corrosion protection system installation details, such as distributed anode installation locations, type and location of anode standoff spacers, reinforcing connections, and GFRP reinforcing mesh shall be prepared by the Contractor and submitted for approval prior to any field installations.

E22.4 Materials

E22.4.1 Zinc Anode

(a) Distributed galvanic units shall be alkali-activated zinc. The zinc anode shall be manufactured in compliance with ASTM B 418 Type II (Z13000) and ASTM B69 Rolled Special High Grade Zinc (Z13004) using zinc in compliance with ASTM B6 Special High Grade (Z13001) with iron content less than 15 ppm. The dimensions and zinc content of the anode shall be as recommended by the Contractor's enlisted NACE specialist and as approved by the Contract Administrator.

(b) The zinc shall be alkali-activated with a pH greater than 14. The anode unit shall contain no constituents that are corrosive to reinforcing steel as per ACI 222R such as chlorides, bromides, or other halides. The anode unit shall be supplied with a minimum of two lead wires of sufficient length to make connections between anodes and the reinforcing steel.

(c) The galvanic protection shall be Galvanode DAS distributed anode system supplied by Vector Corrosion Technologies, or approved equal.

(d) Application for approved equals shall be requested in writing two weeks before submission of project bids. Application for galvanic anode equals shall include verification of the following information:

(i) The zinc anode is alkali-activated with a pH of 14 or greater.

(ii) The anode unit does not contain any corrosive constituents detrimental to reinforcing steel, e.g. chloride, bromide, etc.

(iii) Proven track record of the anode technology showing satisfactory field performance with a minimum of three projects of similar size and application.

(iv) Independent third party evaluation of the anode technology, e.g. Hitec, Concrete Innovations Appraisal Service, BRE, etc.

E22.4.2 Concrete

(a) Concrete mixture shall be of sufficient consistency to encapsulate the anodes without voids or segregation. Concrete shall have an electrical resistivity of less than 15,000 ohm-cm. Concrete mixtures that contain pozzolanic materials such as silica fume, ground-granulated blast-furnace slag, or fly ash will reduce the electrical conductivity of the concrete and may not be suitable for use.

E22.5 Construction Methods

E22.5.1 General

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

(b) The anode units are connected to the reinforcing steel and encased in a concrete with a minimum of 2 inches of clear concrete cover over the anode units. After the anodes are installed and encased in concrete, the anodes will provide galvanic protection to the existing reinforcing steel in the deck.

E22.5.2 Manufacturer Technical Assistance

(a) The contractor shall enlist and pay for a NACE-qualified Cathodic Protection Specialist employed by the corrosion mitigation technology company to provide the design of distributed anode to be used as well as a monitoring system. A deck corrosion potential survey result will be provided. The minimum active service life to design for is 35 years. The numbers of monitoring points and their locations are to be as recommended by the NACE Specialist and as approved by the Contract Administrator.

(b) The contractor will enlist and pay for the services of a NACE-qualified corrosion technician supplied by the galvanic anode manufacturer to provide training and on-site technical assistance during the installation of the galvanic column protection system. The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.

(c) The contractor shall coordinate its work with the designated corrosion technician to allow for site support during project start-up and initial anode installation. The technician shall provide contractor training and support for development of application procedures, shop drawings for submittals, anode and concrete installation, reinforcing steel connection procedures, and verification of electrical continuity of embedded steel.

E22.5.3 Surface Preparation

(a) Exposed reinforcing steel and concrete should be cleaned by abrasive blasting or other means to remove all corrosion by-products and other materials that may inhibit bonding of the concrete encasement.

E22.5.4 Reinforcing Steel Connections

(a) The Contractor shall directly connect each anode unit to exposed reinforcing steel receiving corrosion protection. Whenever possible, electrical connections should be located at repair areas where reinforcing steel is exposed.

(b) Electrical connections to the reinforcing steel shall be established using suitable mechanical, welded stud or brazing techniques. Proposed electrical connection details shall be approved by the anode manufacturer and shall be detailed on the shop drawing submittal.

(c) All reinforcing steel connections shall receive a coat of 100% solids, non-conductive epoxy such that no wire connections or brazing material will be in contact with the

concrete when concrete pouring is complete. The Contractor shall verify continuity between the connections and the reinforcing steel prior to coating with epoxy.

E22.5.5 Electrical Continuity

(a) Reinforcing steel shall be tested for electrically continuity. Maximum DC resistance shall be 1 ohm or maximum DC voltage shall be 1 mV. Steel found to be discontinuous shall have continuity re-established by tying to other bars with steel tie wire or other approved means.

E22.5.6 Galvanic Anodes

(a) Distributed galvanic anode units shall be installed with an even spacing as shown on the drawing or as recommended by the manufacturer. The anodes shall be secured against plastic spacers that provide minimum clearance between the existing concrete surface and the anode 25 mm or as sufficient to allow complete consolidation of the concrete around the anode.

E22.5.7 Concrete Placement

(a) Follow Section E23 “Structural Concrete”.

E22.6 Measurement and Payment

(a) The Works covered under this section will not be measured.

(b) The Works will be paid for at the Contract Lump Sum Price for ”Bridge Deck Corrosion Protection,” which price will be payment in full for supplying all materials/ equipment and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E23. STRUCTURAL CONCRETE

E23.1 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.

E23.2 Scope of Work

(a) Supplying and placing structural concrete for partial deck replacement;

(b) Supplying and placing structural concrete for deck extensions and wingwalls;

(c) Supplying and placing structural concrete for approach slabs;

(d) Supplying and placing structural concrete for sleeper slab;

(e) Supplying and placing structural concrete for median and traffic barriers; and

(f) Supplying and placing structural concrete for reinforced concrete pavements.

E23.3 Submittals

E23.3.1 General

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

(b) The contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed materials to be used.

E23.3.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). 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.

E23.3.3 Concrete Mix Design Test Data

(a) Concrete

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

(ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (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.

E23.3.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least 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.

E23.3.5 Temporary False Work, Formwork and Shoring Works

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete

placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(b) Design Requirements

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

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

(iii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of CSA S269.1, “False Work for Construction Purposes.” The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iv) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.3-M92. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval.

(v) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.

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

(i) 20-mm plywood: studding 400 mm centre to centre (max.),
walers 760 mm centre to centre (max.)

(vii) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(viii) Formwork shall be designed to provide chamber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(ix) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

(xi) Mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.

(xii) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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

(xiv) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.

(c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. False work must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.

(d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E23.3.6 Screed for Deck Slab Concrete

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

E23.3.7 Concrete Deck Slab Pour Sequence and Schedule

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

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

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

E23.4 Materials

E23.4.1 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.

E23.4.2 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.

E23.4.3 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.

TABLE E23.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	Slope Paving Repairs	35 @ 28 Days	C-1	1	20 mm	-	-
Type 2	Deck Slab, Traffic Barriers, Median, and Approach Slabs	35 @ 28 Days	C-1	1	20 mm	Corrosion Inhibitor, Synthetic Fibres	0.15

E23.4.4 Working Base Concrete

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

E23.4.5 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA 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.

E23.4.6 Admixtures

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

(b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E23.4.7 Cementitious Materials

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

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

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.

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

E23.4.8 Water

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

E23.4.9 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/m3.

E23.4.10 Synthetic Fibres

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

E23.4.11 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.

E23.4.12 Form Coating

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

E23.4.13 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B6. This formwork liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.

(b) Paper-lined forms shall be used on all soffit surfaces, such as deck slab overhangs. The Contractor shall provide conclusive evidence that the paper-lined form proposed for use will not stain or otherwise blemish the hardened concrete surface.

E23.4.14 Architectural Formwork Liner

(a) The Contractor shall supply and install the architectural concrete finish formwork liner for use at the locations as shown on the Drawings in accordance with the Manufacturer’s recommended procedures. Approved products are #154 (½” sine wave) by Scott Systems.

E23.4.15 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.

E23.4.16 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.

E23.4.17 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

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

(i) 1 part water;

(ii) 1 part latex bonding agent; and

(iii) 1½ parts Type GUSF Portland cement.

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

E23.4.18 Epoxy Adhesive

(a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B6.

E23.4.19 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.

E23.4.20 Cementitious Grout

(a) Cementitous grout shall be nonshrink and nonmetalic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E23.4.21 Patching Mortar

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

E23.4.22 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.

E23.4.23 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.

E23.4.24 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.

E23.4.25 Low Density Styrofoam

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

E23.4.26 Backup Rod

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

E23.4.27 Screed Bases and Chairs

(a) Screed bases shall be Hilti HAS 304 stainless steel threaded rods, or equal as accepted by the Contract Administrator, in accordance with B6.

(b) Screed chairs shall be Mega Screed as supplied by Brock White Canada Company, or equal as accepted by the Contract Administrator, in accordance with B6.

E23.4.28 Dampproofing

(a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with 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., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B6.

E23.4.29 Galvanized Dowels and Galvanized Expansion Sleeves

(a) Dowels and expansion sleeves shall be fabricated in accordance with CSA Standard CAN/CSA-G30.18-M92.

(b) The dowels shall be galvanized in accordance with CSA Standard G164-M92, to a minimum net retention of 600 g/m2.

E23.4.30 Miscellaneous Materials

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

E23.4.31 Benchmark Plugs

(a) Benchmark plugs shall be supplied by the City. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be shown on all Drawings.

E23.5 Equipment

E23.5.1 General

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

E23.5.2 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.

E23.5.3 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.

(c) Moveable Work Bridges for Deck Slab Concrete

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

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

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

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

E23.5.4 Placing and Finishing Equipment for Approach Slab Concrete

(a) Mechanical Screed for Approach Slab Concrete

(b) The mechanical screed shall be:

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

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

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

(iv) Capable of producing the required flatness tolerance as specified in Clause E31.7.7 of Specification E31.

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

(c) Movable Work Bridge for Approach Slab Concrete Works

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

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

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

E23.6 Construction Methods

E23.6.1 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.

E23.6.2 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. No formwork shall extend beneath the underside of the superstructure.

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

(iv) 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.

(v) 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.

(vi) 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.

(vii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

(ix) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.

(x) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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

(xii) 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.

(xiii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.

(b) Form panels shall be constructed so that the contact edges are kept flush and aligned.

(c) Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.

(d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.

(e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.

(f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 25 mm in diameter. Break-back type form ties shall have all spacing washers removed and the tie shall be broken back a distance of at least 20 mm from the concrete surface. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour.

(g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

(h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be

the sole judge of their condition and his decision shall be final regarding the use of them again.

(i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after 48 hours for the Contract Administrator to judge the type of surface produced.

(j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

E23.6.3 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.

(d) Refer to, E23.6.14, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E23.6.4 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.

E23.6.5 Concrete Bridge Traffic Barrier Joints

(a) Finishing of Concrete Barrier Joints

(i) The installation of the fibre joint filler and the emseal joint sealing shall be undertaken as shown on the Drawings.

(ii) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods.

(iii) The emseal joint sealing at the barrier joints shall be installed as per the Manufacturer’s recommendations.

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

(v) The supply and installation of emseal joint sealing and fibre joint fillers shall be considered incidental to the Work, and no additional measurement or payment shall be made for this Work.

E23.6.6 Anchor Units for Bridge Traffic Barrier Posts and End Rail Units

(a) All anchor units shall be as specified on the Drawings.

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

(c) The Contractor shall coordinate the installation of aluminum traffic bridge posts and rails as described in the E28, “Supply and Installation of Aluminum Traffic Barrier”.

E23.6.7 Permeable Formwork Liner

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

(b) The permeable formwork liner shall be used for only one (1) application.

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

E23.6.8 Architectural Formwork Liner

(a) Architectural formwork liner shall be used at locations shown on the Drawings.

(b) The architectural formwork liner shall be replaced after each use unless specifically allowed to be reused by the Manufacturer, as approved by the Contract Administrator.

(c) The supply, setup, installation, and removal of architectural formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E23.6.9 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.

E23.6.10 Structure Identification Date

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

E23.6.11 Deck Extension Works

(a) Deck Extension Works include the wingwalls, as shown on the Drawings.

(b) Application of Dampproofing

(i) Brush or spray primer on all surfaces, brushing into all corners. Apply two (2) coats of dampproofing allowing the first coat to dry before applying the second coat. Minimum application rate per coat shall be 0.6 L/m2.

(ii) After application of the second coat, dampproofed areas shall be allowed to dry a minimum of 48 hours prior to backfilling.

E23.6.12 Approach Slabs Works

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

E23.6.13 Supply of Structural Concrete

(a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.

(b) All mixing of concrete must meet the provisions of 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 Owner upon request.

(d) Delivery of Concrete

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

(e) Concrete Placement Schedule

(i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:

(i) Limit the amount to be placed at any time (using adequate construction joints);

(ii) Augment his facilities and Plant in order to complete the proposed placement;

(iii) In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and

(ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E23.6.14 Preparation for Concreting Against Hardened Concrete

(a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:

(i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.

(ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.

(iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

(iv) For the Bridge median slab, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E23.6.15 Placing Structural Concrete

(a) General

(i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.

(b) Dry Run for Deck Slab Screed Machine

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

(c) Placing Structural Concrete

(i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m2/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.

E23.6.16 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

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

(b) Type 1 Finish – Exposed Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes, but excluding soffit surfaces where an architectural form finish is specified.

(ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

(iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.

(iv) The surfaces shall be patched as specified in this Specification.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces, with the exception of the approach slab concrete shall be finished as outlined hereinafter.

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish – Approach Slab Concrete

(i) After final floating, the slab surface shall receive coarse transverse scored texture by drawing a steel tined broom uniformly across the slab surface, to the satisfaction of the Contract Administrator.

(e) Type 4 Finish - Surfaces Below Finished Grade

(i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E23.4.21, E23.4.17, and E23.6.19 of this Specification.

(ii) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E23.4.28 of this Specification.

(f) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

(ii) The supply, set up, operation, and finishing of working base concrete shall be considered incidental to the placement of working base concrete, and no separate measurement or payment shall be made for this Work.

E23.6.17 General Curing Requirements

(a) Refer to E23.6.20 for cold weather curing requirements an E23.6.21 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 3ºC in one hour or 20ºC 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 E23.6.17(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.

E23.6.18 Form Removal

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

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

(c) 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.

E23.6.19 Patching of Formed Surfaces

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

(b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.

(c) Patching of formed surfaces shall take place within 24 hours of formwork removal.

(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.

E23.6.20 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.

E23.6.21 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

(ii) 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.

TABLE E23.2: ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, M	TEMPERATURES °C	
	MINIMUM	MAXIMUM
Less than: 1 1.2	 10 5	 27 25

E23.6.22 Cleanup

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

E23.7 Concrete Quality

E23.7.1 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.

E23.7.2 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.

E23.7.3 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.

E23.7.4 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.

E23.7.5 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 E23.3.2of 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 E23.3.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-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 (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Specimens shall be sampled in accordance with E23.7.5(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.

E23.7.6 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.

E23.8 Measurement and Payment

E23.8.1 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.

E23.8.2 Reinforced Concrete Pavement

(a) Reinforced concrete Pavement Concrete shall be paid for at the Contract Unit Price per cubic metre “(250 mm thick) Reinforced Concrete Pavement” measured as specified herein, performed in accordance with this Specification and accepted by the

Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E24. CONCRETE REINFORCEMENT

E24.1 Description

(a) This Specification shall cover the supply, fabrication, anchoring, and placement of the following reinforcing bars for structural concrete:

(i) GFRP reinforcing bars for bridge deck;

(ii) Stainless steel reinforcing bars for traffic barriers and median on the concrete deck;

(iii) MMFX steel reinforcing bars for approach slabs and for traffic barriers and median on the approach slab; and

(iv) MMFX steel reinforcing bars for sleeper slab (at expansion joints in concrete pavements), for (250 mm thick) reinforced concrete pavements, for the traffic barriers on the reinforced concrete pavement along the MSE wall, and for the overhead sign structure pile foundation.

(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.

E24.2 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.

E24.3 Materials

E24.3.1 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.

E24.3.2 MMFX Steel Reinforcing

(a) MMF reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

(b) MMFX steel bars as manufactured by MMFX Steel Corporation of America or

(c) Low-carbon Chromium (corrosion-resistant uncoated) bars with a minimum of 8% by weight chromium, meeting the requirement of ASTM A615 Grade 75 and ASTM A1035-04.

E24.3.3 GFRP Reinforcing

(a) GFRP reinforcing shall be deemed to include all reinforcing bars, tie-bars, and dowels.

(b) ASLAN 100 by Hugh Brothers or approved equals

E24.3.4 Stainless Steel Reinforcing

(a) Stainless Steel reinforcing shall be deemed to include all reinforcing bars, tie-bars and dowels.

(b) Stainless Steel Reinforcing Bars: to ASTM A955M, 300 Series, Grade 420, Type 2205 Duplex or Type 316 LN.

(c) The reinforcement deformations shall conform to the requirements of ASTM A615.

(d) The stainless steel reinforcement shall be mechanically or chemically descaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag or oxidation.

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

E24.3.5 Bar Accessories

(a) Bar accessories shall be of a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(b) Bar chairs, bolsters, and bar supports shall be cementitious material. No plastic, PVC, or galvanized bar chairs will be used.

(c) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator.

(d) Bar chairs, bolsters, and bar supports on hydro-demolished deck surface may be fabricated from GFRP and some shall be capable of holding the GFRP bars down as well as holding them up. The spacing of the ones that are capable of holding the GFRP bars down as well as holding them up shall be uniformly spaced and not spaced further apart than 3.0 m on centre in each direction. The spacing of the bar supports that keep the GFRP bars from going down shall be spaced to provide adequate support to maintain the GFRP bars rigidly in position. All bar chairs, bolsters, and bar supports shall be tied to GFRP bars.

(e) 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 FRRP, MMFX, and stainless 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. Construction Methods

E24.4 Construction Methods

E24.4.1 Supply

(a) MMFX-2 reinforcement shall be bent to the proper shape in a plant that has suitable devices for bending as recommended in the Reinforcing Steel Institute of Canada (RSIC) Manual at Standard Practice. Heating shall not be used as an aid in bending.

(b) GFRP reinforcement shall be bent to the proper shape during fabrication. Absolutely no field bending of the bars is permitted. Should modifications to the GFRP reinforcement be required, the Contractor shall notify the Contract Administrator immediately.

(c) Stainless steel reinforcement shall be bent to the proper shape in a plant that has suitable devices for bending stainless steel as recommended in Reinforcing Steel Institute of Canada (RSIC) Manual of Standard Practice. Heating shall not be used as an aid in bending. The equipment used in the plant shall not cause any surface contamination or damage to the surface of the bars. Stainless steel shall be tagged, indicating the mill and fabricator, stainless steel type and grade, and bar mark number including stainless designation.

E24.4.2 Handling and Storage

(a) General

(i) The Contractor shall handle and store the concrete reinforcement in a manner that ensures it is not damaged or contaminated with dirt or other materials.

(ii) The concrete reinforcement shall not be placed directly on the ground. Timber pallets, platforms, skids or other supports shall be placed under the reinforcement to keep it free from dirt and mud and to provide easy handling.

(iii) Prior to concrete placement, the Contractor and Contract Administrator shall inspect the concrete reinforcement for surface damage.

(b) MMFX 2

(i) All MMFX 2 reinforcement shall be clean and free from paint, oil, millscale and other injurious defects.

(ii) Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area and tensile properties of a hand-wire-brushed specimen are not less than the requirements specified herein.

(c) GFRP Reinforcement

(i) The Contractor shall load, haul, store, and handle the GFRP bars in accordance with the Manufacturer/Supplier's instruction to prevent damage. GFRP bars are susceptible to surface damage; therefore, special care is required in the loading, hauling, storage and handling of these bars. Bundling bands shall be padded or suitable banding shall be used to prevent damage to the reinforcement.

(ii) The GFRP bars shall be covered with an opaque material to avoid UV radiation and Exposure to chemical substances.

(iii) GFRP bars are very light and flexible; therefore, hoisting bundles of GFRP shall be performed with a strongback spreader bar or multiple supports to avoid excessively bending of the bars. The GFRP reinforcement shall not be dropped or dragged.

(d) Stainless Steel Reinforcement

(i) All stainless steel reinforcement shall be free of mud, oil and other contaminants that adversely affect bonding strength, and deposits of iron and non-stainless steel. Stainless steel reinforcing bars will be rejected if:

(i) any area of contamination of the stainless steel by iron exceeds 100 mm in length;

(ii) two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or

(iii) there are frequent small occurrences of rust contamination along the full length of the bar.

(ii) If stainless steel reinforcing bars have been rejected due to excessive iron contamination, the Contractor may attempt to treat the bar to remove the contamination. This treatment can be accomplished by mechanical cleaning with a (stainless steel) wire brush, or by a polishing machine, or by chemical treatment (pickling). If the treatment(s) are not successful, the contaminated bar(s) shall be replaced at no cost to the Owner.

(iii) If stainless steel reinforcing bars are mechanically damaged the bars will be rejected and the Contractor shall replace the rejected bars at no cost to the Owner. Any cuts into a bar, sharp tears or flattening of the deformations on the bars are all mechanical damage to the bars which will be cause for rejection.

E24.4.3 Placing and Fastening

(a) General

(i) The Contractor shall supply and place all necessary support accessories to ensure proper placement of concrete reinforcement. All concrete reinforcement

shall be accurately placed in the positions shown on the Drawings and firmly tied and chaired before placing the concrete.

(ii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcement at the required location and ensuring the specified concrete cover over the reinforcement shall be made from precast concrete or non-rusting metal. Precast concrete supports of approved shape and dimensions, with compressive strengths equal to or exceeding the placed concrete, are acceptable. Any non-rusting metal chairs protruding through the surface of the hardened concrete shall be cut back at least 25 mm, and the holes filled. Non-rusting metal chairs shall not be used to support reinforcement on surfaces that are to be exposed. Where possible, this reinforcement is to be supported entirely from above. The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

(iii) Immediately before placing, concrete reinforcement shall be free of all material that would reduce the bond to concrete.

(b) Placing MMFX 2

(i) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. Welding or tack welding or reinforcing steel will not be allowed. Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

(c) Placing GFRP Reinforcement

(i) The Contractor shall place the GFRP reinforcement in accordance with the Manufacturer/Supplier's instructions.

(ii) All GFRP reinforcement shall be secured to and supported within formwork as required to prevent displacement by concrete placement or workers. All GFRP reinforcement shall be accurately supported using concrete or non-corrosive chairs before concrete placement is started. The Contractor shall use chairs that incorporate a positive locking mechanism to restrain GFRP reinforcement from floating during concrete placement

(iii) The contractor will be allowed to cut the GFRP reinforcement with a high speed grinding cutter, fine blade saw, diamond blade or masonry blade with the prior approval of the Contract Administrator.

(iv) Shearing GFRP reinforcement will not be allowed.

(v) The Contractor shall place the GFRP reinforcement within the tolerances as specified in ACI 117.

(vi) The contractor shall remove form oil from GFRP bars using a method approved by the Manufacturer before placing concrete.

(d) Placing Stainless Steel Reinforcement

(i) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. All tools used for placing shall be stainless steel and shall not be contaminated with iron or non-stainless steel. Welding or tack welding of stainless steel reinforcement will not be allowed. Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

E24.4.4 Tying Reinforcement

(a) MMFX 2

(i) For lapping MMFX 2 bars at the joints and intersection, an ample supply of annealed wire at least 1.5 mm in diameter shall be provided. Proper cutting pliers shall be used and the bending and typing of the wires done as neatly as possible. Twisted ends of the tie wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcement.

(b) GFRP Reinforcement

(i) For lapping GFRP reinforcement at joints and intersections, the Contractor shall tie all intersections using plastic coated or nylon zip ties, or non-rusting material approved by the Contract Administrator.

(c) Stainless Steel Reinforcement

(i) For lapping stainless steel reinforcement at joints and intersections, an ample supply of stainless steel wire shall be provided. The wire shall not be contaminated with iron or non-stainless steel. Proper stainless steel cutting pliers shall be used and the bending and tying of the wires done as neatly as possible. Twisted ends of the wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcement. All tools used shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

E24.4.5 Splicing

(a) General

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

(b) MMFX 2

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

(c) GFRP Reinforcement

(i) Lap splices shall be used wherever detailed or specified on the Drawings and where continuity is required in the reinforcement. The use of mechanical connection or welded splices is not permitted.

(d) Stainless Steel Reinforcement

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

E24.5 Measurement and Payment

E24.5.1 GFRP Reinforcing Bars

(a) Supplying and Placing GFRP reinforcing bars will be measured on a length basis. The length to be paid for (for each bar size) shall be the total number of meters of GFRP bars (for that size) supplied and placed in accordance with this Specification, as computed from the Drawings. Bar accessories will be considered incidental to the Works and will not be measured or separately paid for.

(b) Supplying and Placing GFRP reinforcing bars will be paid for at the Contract Unit Price per meter for the "Items of Work" listed here below, 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.

(i) Supplying and Placing GFRP Reinforcing Bars

(a) 16 mm (#5) GFRP Reinforcing Bars

(ii) Supply GFRP Reinforcing Bars

(a) 22 mm (#7) GFRP Reinforcing Bars (Supply)

(iii) Placing GFRP Reinforcing Bars

(a) 22 mm (#7) GFRP Reinforcing Bars (Installation)

E24.5.2 Reinforcing Steel, MMFX, and Stainless Steel Reinforcing Bars

(a) Supplying and Placing Reinforcing Steel Bars will be measured on a mass basis. The mass to be paid for shall be the total number of kilograms of reinforcing steel supplied and placed in accordance with this Specification, as accepted by the Contract Administrator, as computed from the reviewed shop drawings, excluding the mass of bar accessories.

(b) Supplying and Placing Reinforcing Steel shall be paid for at the Contract Unit Price per kilogram for the "Items of Work" listed here below, 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.

(i) Items of Work:

(a) MMFX Steel Reinforcing Bars

(b) Stainless Steel Reinforcing Bars

E25. CONSTRUCTION OF TINTED CONCRETE

E25.1 Description

(a) This specification covers the construction of “red” tinted concrete pavement, intended to delineate Transit only lanes at various locations in this project. The tinted concrete is finished at grade and is the width of the travel lane. Care must be taken with consistency in water/cement ratio and finishing as the color can be affected load to load.

(b) Referenced Standard Construction Specifications

(i) CW 3310 – Portland Cement Concrete Pavement Works

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

E25.2 Materials And Equipment

E25.2.1 Concrete Materials

(a) The contractor shall base the tinted concrete mix on a mix design that has been approved for the 2009 construction season by the City of Winnipeg Research and Standards Department.

(b) The base mix design shall conform to Section 6 of CW 3310 with the following alterations:

(i) Type 1 mix as per Section 6.2 of CW 3310

(ii) Slump for hand placement shall be 80 mm +/- 20 mm prior to adding superplasticizers (if needed) to facilitate finishing without adding water to the surface.

(c) Alterations to the base mix design will be considered by the Contract Administrator if necessary to account for the concrete tint material and finishing operations.

E25.2.2 Concrete Tint

(a) “Red” coloured metal oxide pigment used to permanently color ready-mix concrete.

(b) Approved Product List

(i) Lafarge Red (Premium) supplied through L.M. Scofield Company

(ii) SG160-2 Sunrise Red supplied through L.M. Scofield Company

(c) Contractor to cast one coloured concrete sample minimum 200 mm X 200 mm in area using base concrete mix for approval by Contract Administrator.

(d) Tinted concrete shall not be placed until sample color has been accepted by the Contract Administrator. The contractor shall demonstrate that the sample will achieve the approximate color advertised by the pigment supplier using local concrete mix materials.

E25.2.3 Superplasticizers

(a) Superplasticizers shall conform to the requirements of CSA CAN3-A266.5 and CAN3-A266.6, but must be compatible with the air-entraining agent. The agent shall be free of chlorides and shall not affect the air-entraining agent's ability to produce a satisfactory air void system.

E25.2.4 Liquid Membrane-Forming Curing Compound

(a) Curing Compound shall be clear (no pigment), and water based conforming to the requirements of ASTM C309.

E25.2.5 Other Materials

(a) All other materials as per CW 3310

E25.2.6 Floating and Finishing Equipment

(a) Use only wood or magnesium floats. Bull floats used for initial finishing shall be constructed of wood only.

E25.2.7 Other Equipment

(a) All other equipment as per CW 3310

E25.3 Construction Methods

(a) Concrete formwork, steel reinforcement, placement, curing, and joint sealing as per CW 3310 except as modified in the following clauses.

(b) As shown on the drawings, construct formed 50 mm headers to define the transverse termination of at-grade coloured concrete where the adjacent pavement is to be asphalt overlaid.

(c) Clean finishing tools and equipment and let dry prior to finishing. Wet tools will fade the colouring. Wetting of tools during finishing operation is not permitted.

(d) Place concrete at a consistent slump. No water shall be added on Site. Superplasticizer may be added at a rate suggested by the concrete supplier if additional workability is needed.

(e) No localized water spray or fogging is permitted to assist in finishing as this will locally fade the colour.

(f) Clear curing compound only shall be used. The use of water curing or plastic film is not allowed. Plastic film for insulation in cold weather must be approved by the Contract Administrator.

E25.4 Measurement and Payment

(a) Construction of Tinted Concrete will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Construction of 230 mm Concrete Pavement (Plain-Dowelled, Tinted)". The area to be paid for will be the total number of square meters of tinted concrete supplied and placed at grade, or below an asphalt overlay in accordance with this specification and accepted by the Contract Administrator.

E26. MECHANICALLY STABILIZED EARTH WALL

E26.1 Description

(a) The Works in this section include the designing, supplying, and installation of the mechanically stabilised earth (MSE) wall as shown on the drawings.

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

E26.2 Materials

E26.2.1 Precast Concrete Panels

(a) Cast from 35 MPa (minimum) concrete (CSA A23.1 exposure Class C-1)

E26.2.2 Soil Reinforcement

(a) Soil reinforcement shall be ASTM A572 Grade 65 steel strip, hot rolled to the required shape and dimensions.

(b) Steel soil reinforcement and steel connection hardware shall be galvanised in accordance with ASTM A123.

E26.2.3 Selected Granular Backfill

(a) Backfill material for mechanically stabilized earth walls shall conform to the following requirements:

(i) Grading: 100% passing 100 mm Sieve, 60% passing 425 mm Sieve and 0-15% passing 75 mm Sieve

(ii) Plastic Index < 6, determined in accordance with AASHTO T90

(iii) Angle of internal friction of not less than 34 degrees, as determined by the standard Direct Shear Test, AASHTO T 236, on the portion finer than the No. 10 sieve, utilizing a sample of the material compacted to 95% of AASHTO T 99, Methods C or D at optimum moisture content. No testing is required for backfill where 80 percent of sizes are greater than 20 mm.

(iv) The materials shall be substantially free of shale or other soft, poor durability particles.

(v) Magnesium sulphate soundness loss of less than 30 percent after four cycles.

(vi) pH of 5 to 10

(vii) Resistivity not less than 3,000 ohm-cm

(viii) Chlorides not greater than 100 ppm

(ix) Sulphates not greater than 200 ppm

E26.2.4 Miscellaneous Components

(a) Structural steel shall conform to AASHTO M 270 (ASTM A709) Grade 36 unless otherwise specified.

(b) Pipe and perforated pipe shall conform to subsections 708 and 709 of the AASHTO Guide Specifications for Highway Construction or as approved by the Contract Administrator.

(c) Filter fabric shall conform to subsection 620 of the AASHTO Guide Specifications for Highway Construction or as approved by the Contract Administrator.

(d) Permeable material shall conform to subsection 704 of the AASHTO Guide Specifications for Highway Construction or as approved by the Contract Administrator.

E26.3 Construction Methods

E26.3.1 Preparations

(a) The contractor shall submit shop drawings and design calculations to the Contract Administrator engineer for review and approval at least 2 weeks before commencing the Work. The designer shall take into account the condition during the future

construction of the bus corridor as shown on the plan. The submitted drawings and design calculations shall include the following:

(i) Complete design calculations substantiating that the proposed design satisfies the required design parameters stated on the plan

(ii) Complete details of all elements required for the proper construction of the stabilised walls, including complete material specifications

(iii) Earthwork requirements including specifications for material and compaction of backfill

(iv) Details of revisions or additions to drainage systems or other required facilities

(v) Other information required in the plans or requested by the Contract Administrator

(b) The Contractor shall not start the Work until the Contract Administrator has approved the shop drawings. Such approval shall not relieve the contractor of any of his responsibility under the contract for the successful completion of the Work.

E26.3.2 Construction

(a) Construct concrete bearing pad for the precast panels.

(b) Pre-install connecting points for soil reinforcing elements in accordance with the approved shop drawings.

(c) Connect soil-reinforcing elements to the precast panels. Uniformly tension all soil reinforcement to remove any slack in the connection or material.

(d) Selected granular backfill material shall be placed and compacted simultaneously with the placement of soil reinforcement. Placement and compaction shall be accomplished without distortion or displacement of the soil reinforcement.

(e) Sheep foot or grid-type rollers shall not be used for compacting backfill within the limits of the soil reinforcement. At each level of soil reinforcement, the backfill material shall be roughly levelled to an elevation approximately 30 cm above the level of connection at the facing before placing the soil reinforcement.

(f) Construct cast in place concrete coping (top cap) as shown on the shop drawing.

E26.4 Measurement and Payment

(a) The Works in this section will be measured on a square meter basis and paid for at the Contract Unit Price per square meter for “MSE Retaining Wall.” The length to be paid for will be the total number of linear meters of along the centreline of the median from end of each approach slab of end of west approach slab as shown on the drawings and as accepted by the Contract Administrator.

(b) Calculate the stabilised wall area for each wall using:

(i) Height of wall from bottom of concrete bearing pad to top of coping

(ii) Length of wall along its centreline

(iii) Total square meter area of stabilised walls forms the basis of payment for the Works.

(c) The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Works.

E27. ALUMINIUM BALANCED TRAFFIC BARRIER RAIL

E27.1 Description

(a) This Specification covers the supply and installation of aluminum balanced traffic barrier rail on the aluminum traffic barrier rail posts on Jubilee Overpass.

(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

E27.2 Materials

E27.2.1 General

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

(b) All materials supplied under this Specification shall conform to the requirements of The City of Winnipeg - Standard Construction Specification CW 3650-R4 and as specified herein.

E27.2.2 Aluminum Balanced Traffic Barrier Rail Components

(a) In addition to the materials identified in CW 3650-R4, the following traffic barrier rail components are to be supplied in accordance with the Contract Drawings and as specified herein.

(i) Rail End Sections
(ii) Rail Clamp Bars (146 mm in length)
(iii) Expansion Splice Bars (700 mm in length)
(iv) Anchor Bolts for the Rail End Sections
(v) Cap screws shall conform to ASTM A276 Type 316.

E27.3 Construction Method

(a) The installation of aluminum balanced traffic barrier rail shall conform to the requirements of The City of Winnipeg - Standard Construction Specification CW 3650-R4 and as shown on the Contract Drawings, to the satisfaction of the Contract Administrator.

(b) Anchor bolts for aluminum balanced traffic barrier rail end sections are to be supplied and installed in accordance with Section, “Aluminum Traffic Barrier Rail Posts”, incidental to this Specification.

E27.4 Measurement and Payment

(a) The supply and installation of aluminum balanced traffic barrier rail, including rail end sections, will be measured on a linear metre basis and will be paid for at the Contract Unit Price per linear metre for the “Supply and Installation of Aluminum Balanced Traffic Barrier Rail”. The number of linear metres to be paid for shall be the total number of linear metres of aluminum balanced traffic barrier rail, including rail end sections, supplied and installed in accordance with this Specification as accepted by the Engineer, as computed by summing up the installed horizontal length of the individual rail/rail end section lengths.

(b) The supply of all hardware required for installation of the Aluminum Balanced Traffic Barrier Rail shall be considered incidental to the installation of the Aluminum Balanced Barrier and no additional measurement or payment shall be made.

E28. ALUMINIUM TRAFFIC BARRIER RAIL POSTS

E28.1 Description

(a) This Specification shall cover the supply and installation of aluminum traffic barrier rail posts on the Jubilee Overpass.

(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.

E28.2 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 traffic barrier bridge rail posts shall be supplied conforming to the requirements of the Contract Drawings

(d) The traffic barrier rail posts shall conform to the requirements of ASTMB221M-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. All edges and corners of traffic barrier rail post extrusions and plates shall be rounded smooth as shown on the Contract Drawings. Rounded edges damaged during installation shall be repaired by the Contractor to the satisfaction of the Engineer.

(e) Rail post anchor bolts shall be 250 mm x 16 mm diameter stain less steel; each complete with one stainless steel hex nut, one stainless steel lock washer, one stainless steel flat washer, and one 50 diameter galvanized flat washer. The anchor bolts shall be threaded for 65 mm and shall be pre-bent as shown on the Contract Drawings (where applicable). The stainless steel shall conform to ASTM A276 Type 316.

(f) Rail Post Shims: Rail post shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the Contract Drawings. Supply of shims will be considered incidental to the supply of bridge rail posts.

(g) Fabreeka pads and washers shall be 5 mm thick Fasco SA47 as manufactured by Fabreeka International. Supply of pads and washers shall be considered incidental to the supply of aluminum traffic barrier rail posts

(h) The anti-seize compound to be applied to all threaded components when being assembled shall be LPS-3, manufactured by Holt-Lloyd (Canada) Ltd., Markham, Ontario, L3R 2Z3.

E28.3 Construction Methods

(a) The installation of aluminum traffic barrier rail posts shall conform to the requirements of the Contract Drawings, to the satisfaction of the Contract Administrator.

(b) Traffic barrier rail posts shall be supplied by the Contractor, completely fabricated, as shown on the Contract Drawings.

(c) 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.”

(d) The rail post anchor bolts shall be cast into the top of the concrete barrier in a careful, workmanshiplike manner in the location and to the grade as shown on the Contract Drawings or as directed by the Engineer, in conjunction with the concrete operations. This work will be considered incidental to the installation of traffic barrier rail posts.

(e) The traffic barrier rail posts shall be installed in a careful, workmanshiplike manner onto the anchor bolts to the grade and alignment shown on the Contract Drawings or as directed by the Engineer.

(f) The grade of the rail posts must be averaged over irregularities in the grade of the concrete in order to ensure a smooth and uniform grade on the barrier rail. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be separated with a Fabreeka pad. A minimum 3 mm aluminum shim shall be installed under each post.

(g) In the event of damage to any materials, the Contractor shall immediately notify the Engineer and make all necessary repairs or replacements, at his own expense, to the satisfaction of the Engineer. In no case shall the Contractor install a damaged component on the barrier.

E28.4 Measurement and Payment

(a) The supply and installation of aluminum traffic barrier rail posts, will be measured on a unit basis and will be paid for at the Contract Unit Price per unit for "Supply and Installation of Aluminum Traffic Barrier Rail Posts". The number of traffic barrier rail posts to be paid for shall be the total number of traffic barrier rail posts supplied and installed in accordance with this Specification and accepted by the Contract Administrator.

(b) The supply of all hardware required for installation of the Aluminum Traffic Barrier Rail Posts shall be considered incidental to the installation of the Aluminum Balanced Barrier and no additional measurement or payment shall be made.

E29. EXPANSION JOINT SEALS

E29.1 Description

(a) The Works in this section consist of the furnishing and installing of joint sealing and/or joint sealing system at the following joint locations of the Jubilee Overpass:

(i) Between roadway pavement slab and sleeper slab at east end of the overpass

(ii) Between sleeper slab and approach slab at east end of the overpass

(iii) Between approach slab and roadway pavement slab at west end of the overpass

(b) The Works also include the furnishing and installing of joint sealing at the following joint locations:

(i) Vertical joint seals between the deck extensions and the existing abutments

(ii) Vertical joint seals between sections of traffic barriers on the overpass and along the top of the MSE wall

(c) The joint sealing shall be capable of preventing the intrusion of material and water through the joint, the details of which shall be as shown on the plans and stated in this specification.

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

E29.2 Materials

E29.2.1 General

(a) Preformed elastomeric joint seal (Compression Seal): to ASTM D2628 and ASTM D3542

(b) Lubricant-adhesive for use with preformed elastomeric seal: to ASTM D4070

(c) Expansion Joint Armour: Hot Rolled L-Shape – ASTM A36

(d) Shear Stud: to ASTM A108

(e) Backing Rod: to ASTM D5249

(f) Joint Sealant: Low modulus silicone rubber type with 1200% ultimate elongation

(g) Vertical Joint Seal: EMSEAL or approved equals

E29.2.2 Compression Seals

(a) The compression seals for the 50 mm wide joints (at 15○C) shall be CV-3000 neoprene compression seals as manufactured by D.S. Brown Company or approved equal.

(b) The compression seals for the 80 mm wide steel armoured joint (at 15○C) shall be a CV-6000 neoprene compression seal as manufactured by D.S. Brown Company or approved equal.

E29.3 Construction Methods

E29.3.1 Metal Fabrication

(a) Fabricate work square, true, straight and accurate to the required size, with splices closely fitted and properly secured.

(b) Perform welding work in accordance with CSA W59 unless specified otherwise.

(c) Unless noted otherwise, rough edges should be ground smooth prior to galvanizing.

(d) Ensure that exposed welds are continuous foe length of each joint.

(e) Hot dip galvanize in accordance with CSA-G164 to retention of 600 grams per square meter.

E29.3.2 Compression Seals

(a) For the joint sealing at all locations, the contractor shall submit shop drawings and his proposed installation procedures to the Contract Administrator for approval.

(b) Preformed elastomeric joint seals shall not be field spliced except when specifically permitted by the Contract Administrator. Other joint sealing components shall be fabricated and handled in accordance with manufacturer's recommendations.

(c) All joint materials and assemblies, when stored at the job site, shall be protected from damage and assemblies shall be supported to maintain their true shape and alignment. Joint seals shall be constructed and installed to provide a smooth ride. Joints shall be covered over by protective material after installation until final cleanup.

(d) At the time of installation, the joint shall be clean, dry, and free from spalls and irregularities, which might impair a proper joint seal. Concrete or metal surfaces shall be clean, free of rust, laitance, oils, dirt, dust, or other deleterious materials.

(e) Pre-molded elastomeric compression joint seals shall be installed without damage to the seal by suitable hand methods or machine tools. The lubricant-adhesive shall be applied to both faces of the joint prior to installation and in accordance with the manufacturer's instructions.

(f) The preformed elastomeric seal shall be compressed to the thickness specified on the plans or as approved by the Contract Administrator for the rated opening and ambient temperature at the time of installation. Loose fitting or open points between the seal and the edges of the joint will not be permitted.

E29.4 Measurement and Payment

(a) Expansion joint seals at the locations listed in Section 1(a) will be measured and paid for by the linear meter of acceptable joint seal completely installed for "Compression Seal" and for "Compression Seal with Steel Armour". Measurement will be made along the slope of the centerline of the joint seal. Payment shall be considered full compensation for the cost of labour, equipment and materials to furnish and install the deck joint seal.

(b) No measurement or payment will be made for joint sealing at other locations. The Works will be considered incidental to "Structural Concrete".

E30. SUPPLY AND INSTALL DETECTABLE WARNING SURFACE TILES

E30.1 Description

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

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

E30.2 Specifications and Drawings

(a) Referenced Standard Construction Specifications and Standard Details

(i) CW 3235 - Renewal of Existing Miscellaneous Concrete Slabs

(ii) CW 3240 - Renewal of Existing Curbs

(iii) CW 3310 - Portland Cement Concrete Pavement Works
(iv) CW 3325 - Portland Cement Concrete Sidewalk
(v) SD-229C - Curb Ramp for Concrete Pavement
(vi) SD-229D - Curb Ramp for Asphalt Overlay

(b) Attached; SDE Drawings and Installation Manual
(i) SDE-229A - Curb Ramp Layout for Intersections
(ii) SDE-229AA - Detectable Warning Surface in Curb Ramps for Intersections
(iii) SDE-229AB - Curb Ramp Layout for Offset Intersections
(iv) SDE-229BB - Detectable Warning Surface in Curb Ramps for Medians
(v) SDE-229E - Curb Ramp Depressed Curb
(vi) Manufacturer's Installation Manual – Armor-Tile Cast in Place Inline Dome Detectable/Tactile Warning Surface Tile.

E30.3 Materials

(a) Acceptable products for:
(i) Sidewalks: 2'x 4' (610 x 1220mm) Armor-Tile Cast in Place (yellow)
(ii) Multi-use paths: 2'x 5' (610 x 1520mm) 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

(b) Detectable warning surface tiles shall be Highway Yellow (USA) or Safety Yellow (Canada).

(c) Detectable warning surface tiles shall be cast in place type.

(d) Truncated domes on detectable warning surface tiles shall be in accordance with ADA Accessibility Guidelines (ADAAG).

E30.4 Construction Methods

E30.4.1 General

(a) Construct curb ramps, sidewalk ramps and multi-use path in accordance with referenced Standard Construction Specifications, Standard Details, and SDE drawings (attached).

(b) Construct the lip of the depressed curb in accordance with SDE – 229E.

(c) Construct sidewalk ramp grades in accordance with SD-229C and SD-229D.

(d) Install one 610x1220mm tile for each curb ramp for sidewalks.

(e) 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 and to facilitate the installation process.

(f) Orient the detectable warning surface tiles according to the referenced drawings in this specification or as directed by the Contract Administrator.

E30.4.2 Medians and Refuge Islands:

(a) Where the distance from back of curb to back of curb is 1.8m or greater, install one detectable warning surface tile 50mm from each curb.

(b) Where the distance from back of curb to back of curb is less than 1.32m, fill the area between the curbs with detectable warning surface tile(s).

E30.4.3 Multi-use Paths

(a) Construct a curb ramp with a 2.0m depressed curb in accordance with SDE-229E.

(b) Construct a concrete sidewalk ramp 2.0m wide and 0.90m deep in accordance with SD-229C and SD-229D, to receive the tile.

(c) Install one 610 x 1520mm tile for each curb ramp for multi-use paths.

(d) Place the short edge of the tile parallel to the path and 50mm from the back of the depressed curb, centered on the depressed curb

(e) If the width of the asphalt path is greater than the width of the concrete sidewalk ramp, path construct a 1m long taper, or other length as required, to narrow the width of the asphalt path to meet the 2.0m wide concrete sidewalk ramp, as directed by the Contract Administrator.

E30.5 Measurement and Payment

E30.5.1 Supply and installation of detectable warning surface tiles will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Items of work” listed here below. The number of units to be paid for will be the total number of detectable warning surfaces supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(a) Detectable Warning Surfaces:

(b) 2’ x 4’ Armor Tile Cast in Place (Yellow)

(c) The area under the detectable warning surface tile is part of the sidewalk ramp and will be paid in accordance with CW 3235 and CW 3325.

(d) The sidewalk ramp will be paid as 100mm sidewalk in accordance with CW 3235 or CW 3325.

(e) Curb ramp will be paid in accordance with CW 3240 or CW 3310.

E31. HIGH PERFORMANCE CONCRETE (HPC) OVERLAY

E31.1 Description

(a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of High Performance Concrete (HPC) Overlay Works, as specified herein and as shown on the Drawings.

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

E31.2 Scope of Work

(a) The Work under this Specification shall involve the HPC overlay Works, placed on top of the deck replacement concrete.

E31.3 Submittals

E31.3.1 General

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

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

E31.3.2 Concrete Mix Design Requirements

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

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

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

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

(iii) Aggregate source location(s);

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

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

(vi) The limits for slump;

(vii) The limits for air content; and

(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.

(d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance to CSA A23.1-04 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of the approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to any necessary adjustments.

E31.3.3 Concrete Mix Design Test Data

(a) Concrete

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

(ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 16, 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.

E31.3.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least 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.

E31.3.5 Moveable Deck Hoarding

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of the HPC overlay work on site, Shop Drawings showing the fabricated details of the movable deck hoarding, design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.

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

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

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

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

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

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

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

E31.3.6 HPC Overlay Pour Sequence and Schedule

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of the HPC overlay placement:

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

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

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of concrete placement, the proposed placement schedule for the HPC overlay.

E31.4 Materials

E31.4.1 General

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

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

E31.4.2 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.

E31.4.3 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 E31.1.

TABLE E31.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 3	High Performance Concrete (HPC) Overlay	50 @ 56 Days	C-XL	1	14 mm	Crushed Granite Aggregate; Synthetic Fibres; maximum Shrinkage Strain of 450 microstrains @ 56 Days; Set Retarders permitted	0.15

E31.4.4 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 is required.

(iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

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

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12.

(c) Coarse Aggregate – Granite

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

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

E31.4.5 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.

E31.4.6 Cementitious Materials

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

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

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.

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

E31.4.7 Water

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

E31.4.8 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene as accepted by the Contract Administrator, in accordance with B6. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance to the Canadian Highway Bridge Design Code, CAN/CSA-S6-06, Section 16, Fibre-Reinforced Structures, Clause 16.6.

E31.4.9 Curing Blankets

(a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour. An approved product is “Mirafi Geotextile P150”. Alternately, a 10 oz burlap,

5 mil polyethylene, curing blanket white in colour shall be used; “Curelap” manufactured by Midwest Canvas, together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B6.

E31.4.10 Bonding Agents

(a) Latex Bonding Agent

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

(b) Bonding Grout

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

(i) 1 part Water;

(ii) 1 part latex bonding agent; and

(iii) 1 ½ parts Type GUSF Portland Cement.

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

E31.4.11 Miscellaneous Materials

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

E31.5 Equipment

E31.5.1 General

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

E31.5.2 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.

E31.5.3 Finishing Machine for the HPC Overlay

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

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

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

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

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

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

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

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

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

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

E31.5.4 Moveable Deck Hoarding

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

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

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

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

(e) The supply, setup, operation, and takedown of the movable deck hoarding shall be considered incidental to the placement of the deck slab concrete and HPC overlay, and no separate measurement or payment shall be made for this Work.

E31.5.5 Moveable Work Bridges for Bridge Deck Concrete

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

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

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

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

E31.6 Construction

E31.6.1 HPC Overlay

(a) General

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

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

(b) Surface Preparation

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

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

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

(iv) It is permissible that the concrete surface may be prepared by rotomilling, using a BobCAT-sized machine. After rotomilling operations have been completed to the satisfaction of the Contract Administrator, the entire rotomilled surface shall receive a high-pressure water blast to remove all surface microfractures to the satisfaction of the Contract Administrator.

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

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

(vii) Placement of the HPC overlay concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator. The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.

(c) Mixing

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

(d) Dry Run of Finishing Machine

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

(ii) Sufficient screed supporting guide rails to provide the required coverage for the entire pour, as approved by the Contract Administrator, shall be set out and adjusted for height the day prior to the pour. The Contract Administrator will then check the deck grades, as follows:

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

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

"dry run," and screed clearance measurements taken at each support point, by the Contractor. Resetting of the machine and/or screed rails shall be done by the Contractor as required by the Contract Administrator.

(e) Placing HPC Overlay

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

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

(iii) The Contractor shall take every precaution necessary to secure a smooth-riding High Performance Concrete (HPC) overlay surface, within the tolerances indicated in E31.7.7 in this Specification.

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

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

(vi) The overall combination of labour and equipment for proportioning, mixing, placing, and finishing new concrete shall be of such minimum capability as to meet the following requirements, as shown on Table E31.2, "Minimum Requirement for Placing High Performance Concrete (HPC) Overlay", except when noted otherwise on the Drawings.

TABLE E31.2
MINIMUM REQUIREMENT FOR PLACING
HIGH PERFORMANCE CONCRETE (HPC) OVERLAY

TOTAL CONCRETE AREA PER BRIDGE (Square Metre)	MINIMUM REQUIREMENTS (Cubic Metres/Hour)
0 - 275	1.0
276 - 410	1.5
411 - 550	2.0
Over 550	2.5

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

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

(ix) Screed guides shall be placed and fastened in position to ensure finishing of concrete to the required profile. Supporting rails upon which the finishing machine travels shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down device shot into the lower lift deck concrete will not be permitted. Plans for anchoring support rails shall be submitted to the Contract Administrator for acceptance. The Contract Administrator's acceptance must be received in writing by the Contractor prior to the installation of any anchorage devices.

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

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

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

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

(xiv) During the concrete finishing operations, the Contractor shall utilize a 3.05 m (10 ft.) straightedge with a 75 mm (3 inch) semicircular shape, as supplied by Bidwell Inc., and as accepted by the Contract Administrator. It shall be used both for flattening the plastic concrete surface and for checking and verifying the surface flatness before commencing curing of the surface. The entire surface shall be checked and any areas not within the surface flatness tolerances specified under the Quality Control section of this Specification shall be corrected using the straight edge. Care shall be taken to preserve the crown and cross section of the roadway.

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

(f) Curing of the HPC Overlay

(i) Immediately following finishing of the HPC overlay concrete surface, apply fog misting until the concrete has enough strength to support the placement of the predampened curing blankets. The misting device shall not be used to apply

water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water.

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

(iii) Care shall be exercised to ensure that the curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, the Contractor shall stop concrete placement operations until the problem is corrected to the satisfaction of the Contract Administrator.

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

(v) Failure to apply wet curing blankets within 40 minutes after the deck concrete has been deposited shall be cause for rejecting the Works so affected. Concrete in the rejected area shall be removed and replaced at no additional cost to the City.

(vi) It is intended that the surface receive a wet curing blanket cure for at least seven (7) days. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

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

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

(g) Surface Texturing of the HPC Overlay Surface

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

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

(iii) The area 600 mm from the low side of traffic barriers, and the area 300 mm from the high side of traffic barriers is not to be grooved and the grooves shall all end in a straight line parallel to the face of the traffic barrier.

(iv) Saw cuts shall extend no closer than 150 mm to expansion joints and to any deck drains.

(v) The Contractor shall supply all water for surface texturing operations strictly in accordance with Section E31.4.7 of this Specification. All run-off from grooving operations and suspended solids shall be collected at either end of the Bridge off the Bridge approach slabs, in collection tanks, passed through several settling and filtration processes before it is discharged into the sewer system. The final effluent shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge into Sewers, for water quality.

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

(h) Limitation of Operations

(i) Provisions shall be made to protect the concrete by only casting overlay concrete under good weather conditions. This means that the air temperatures shall be between 5°C and 25°C and the surface moisture evaporation rate is less than 0.75 kg/square metre per hour as determined by CSA A23.1-04, Appendix D, "Guidelines for Curing and Protection". Also, it shall not be raining and no rain forecast for the duration of each pour. The Contract Administrator's decision in this matter will be final.

E31.7 Concrete Quality

E31.7.1 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.

E31.7.2 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.

E31.7.3 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.

E31.7.4 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.

E31.7.5 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 E31.3.2 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E31.3.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-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 (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests specimens shall be sampled in accordance with E31.7.5(g).

(f) Testing for shrinkage strain shall take place for HPC overlay in accordance with ASTM C 157.

(g) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".

(h) 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".

(i) Compressive strength tests at fifty-six (56) days shall be the basis for acceptance of all concrete supplied by the contractor. For each fifty-six (56) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-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.

(j) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table E31.1 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.

(k) Notwithstanding CSA A23.2-04, cores taken from HPC overlay must achieve at a minimum 85% of the specified concrete design strength.

E31.7.6 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.

E31.7.7 Surface Flatness Requirements

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

(b) At each location(s) where the absolute difference of 5 mm is exceeded, further detailed contour survey(s) shall be conducted by and at the discretion of the Contract Administrator to determine the extent of the area requiring corrective action, all at the Contractor's expense. Corrective measures shall involve immediate removal of the surface in the areas not meeting the specified surface flatness tolerance and/or acceptable rideability, in the judgement of the Contract Administrator, and replacement of same to a minimum depth of 50 mm, with the perimeter of the area saw-cut to a depth of 25 mm (the cut face to be sloped to key-in the replacement concrete), as directed by the Contract Administrator. If more than 20 percent of the surface is rejected by the Contract Administrator based on the flatness tolerance and/or any other defect, the Contractor shall immediately remove and replace the entire area of the applicable pour.

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

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

E31.8 Measurement and Payment

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

E32. REMOVAL AND SALVAGE OF GREAT UNIT

E32.1 Description

(a) This Specification shall cover the removal and salvage of the existing Great Unit and adjacent aluminum balance barrier on Jubilee Avenue westbound at the entry to the existing westbound ramp to the structure.

(b) The GREAT unit is situated on a concrete base slab with below grade back up block. The exact dimensions of the base slab and back up block are unknown but approximate dimensions are as follows; base slab, approximately 230 mm thick, back up block approximately 900 mm wide, 600 mm long and 1040 mm deep. The concrete base slab and back up block are anticipated to be reinforced.

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

E32.2 Material

E32.2.1 Storage and Handling

(a) All materials shall be handled and stored in a careful and workmanlike manner to the satisfaction of the Contract Administrator.

(b) Any damaged or missing material or components resulting from handling and storage operations shall be replaced at the Contractor's expense, to the satisfaction of the Contract Administrator.

E32.3 Construction Methods

E32.3.1 General

(a) The GREAT Unit shall not be removed until the overhead sign structure it is protecting is removed.

E32.3.2 Pre-Removal Inspection

(a) Prior to the removal and dismantling of the GREAT Unit and balance aluminum barrier, the Contractor and Contract Administrator shall jointly inspect the barrier taking note of any damage above ground level.

E32.3.3 Aluminum Balance Barrier

(a) The adjacent aluminum barrier shall be removed and salvaged in accordance with Clause E12 of this Specification.

E32.3.4 GREAT Unit

(a) The GREAT Unit Components shall be carefully dismantled in a workmanlike manner. Material damaged through negligent operations shall be replaced by the Contractor at his expense.

(b) A minimum of 48 hours prior to commencement of dismantling operations, the Contractor shall spray all the existing hardware with an anti-seize compound to the satisfaction of the Contract Administrator.

(c) All hardware shall be initially loosed with a hand wrench. Once loosened, the hardware may be removed with an impact wrench unless otherwise directed by the Contract Administrator.

E32.3.5 Salvaged GREAT Unit Material

(a) All surplus salvaged material shall be delivered to the City Bridge Yard located at 849 Ravelson Avenue. Contact Mike Terleski, C.E.T. at 794-8510 to arrange a suitable time and date for delivery.

(b) The salvaged material shall be properly placed in the bridge yard at a location determined by City personnel in a manner accepted by the City.

(c) Salvaged material deemed unsuitable for reinstallation shall also be returned to the City Bridge Yard.

E32.3.6 Removal of GREAT Unit Concrete Base Slab and Back Up Block

(a) The GREAT Unit concrete base slab and back up block shall be demolished and the area backfilled to final grade as determined by the Contract Administrator.

(b) The exact dimensions of the base slab are not known. The base slab is approximately 230 mm thick and has a concrete anchor block approximately 900 mm wide, 600 mm long and 1040 mm deep. The concrete base slab and back-up anchor block are anticipated to be reinforced.

(c) The void shall be backfilled with compacted suitable site fill material to the underside of topsoil elevation.

E32.4 Measurement and Payment

(a) The removal and salvage of the existing GREAT Unit will be measured on a unit basis and will be paid for at the Contract Unit Price for “Removal and Salvage of Existing GREAT Unit”. The number of GREAT Units paid for shall be the total number of GREAT Units removed and salvaged in accordance with this Specification, accepted and measured by the Contract Administrator.

(b) No separate measurement and payment will be made for removal of the adjacent aluminum balance barrier, demolition of the base slab and back-up anchor block, or backfilling the void. This Work will be considered incidental to the Work of this Specification.

APPENDIX ‘A’

GEOTECHNICAL REPORT

APPENDIX 'A' – GEOTECHNICAL RLEPORT

TABLE OF CONTENTS

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawing and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.

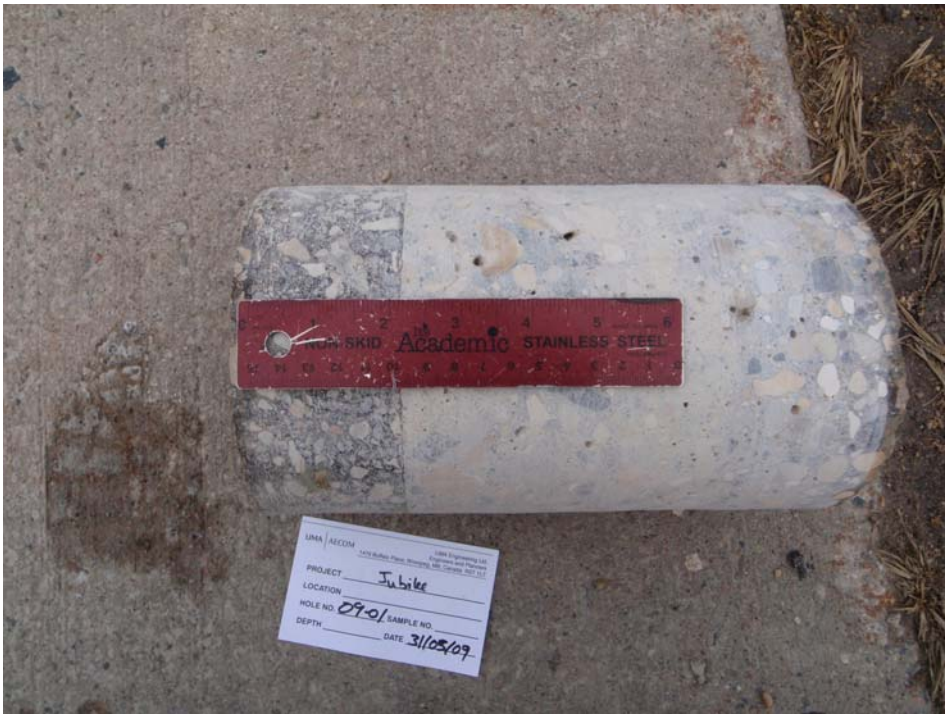


Photo 01: Pavement core at the location of TH 09-01

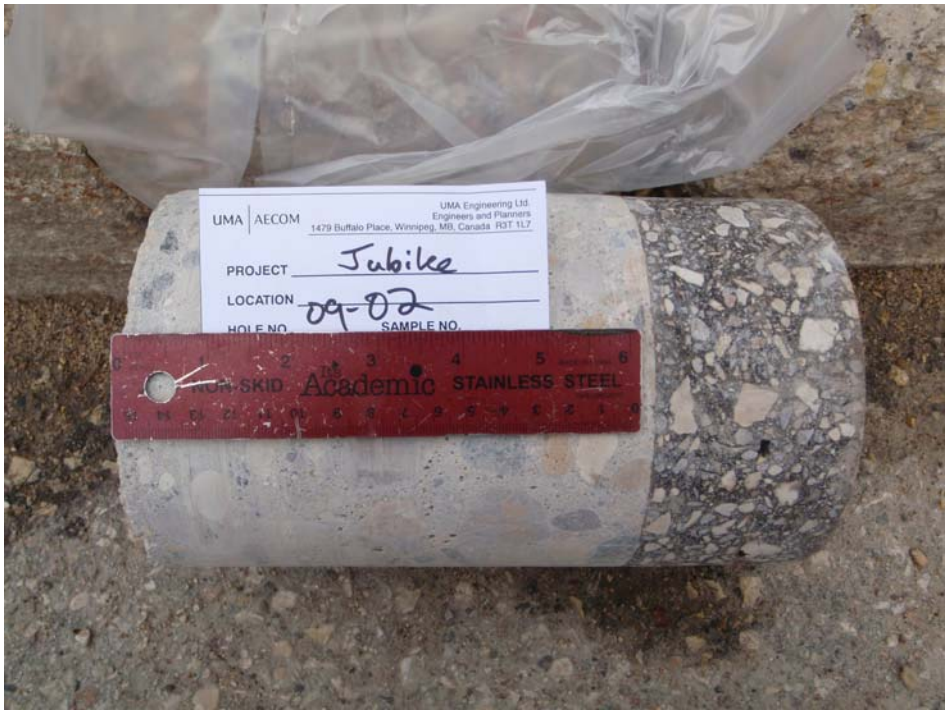


Photo 02: Pavement core at the location of TH 09-02

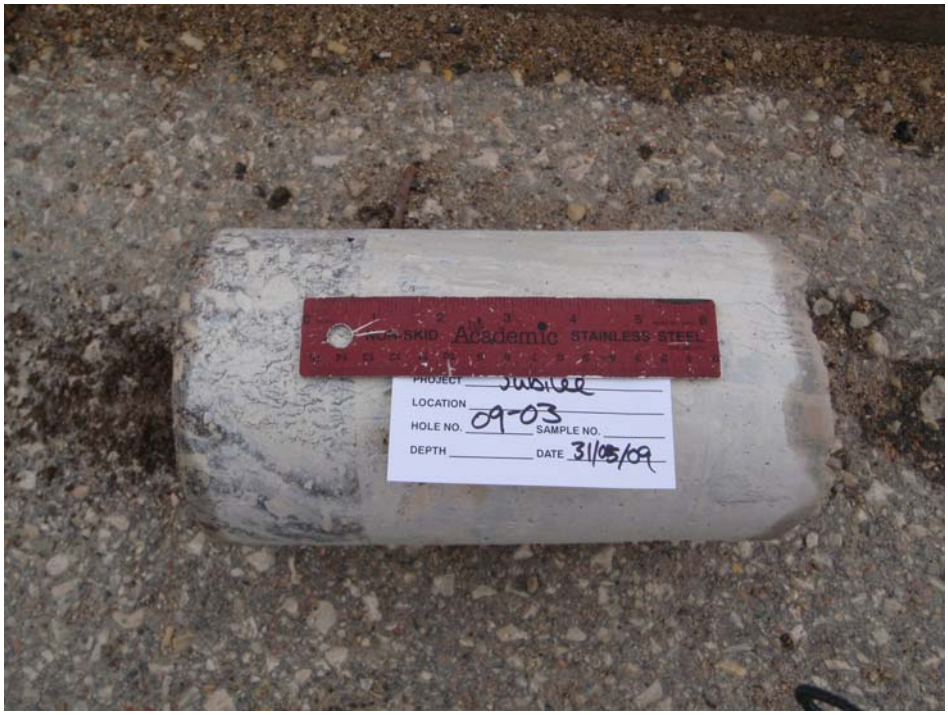


Photo 03: Pavement core at the location of TH 09-03

Photo 04: Pavement core at the location of TH 09-04

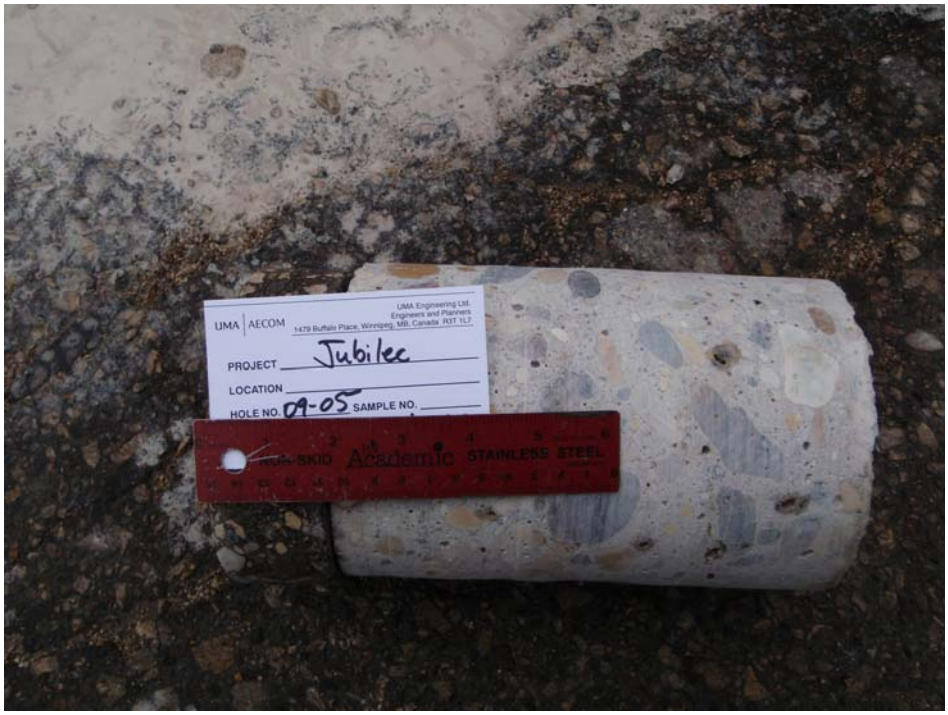


Photo 05 Pavement core at the location of TH 09-05

Photo 06: Pavement core at the location of TH 09-06

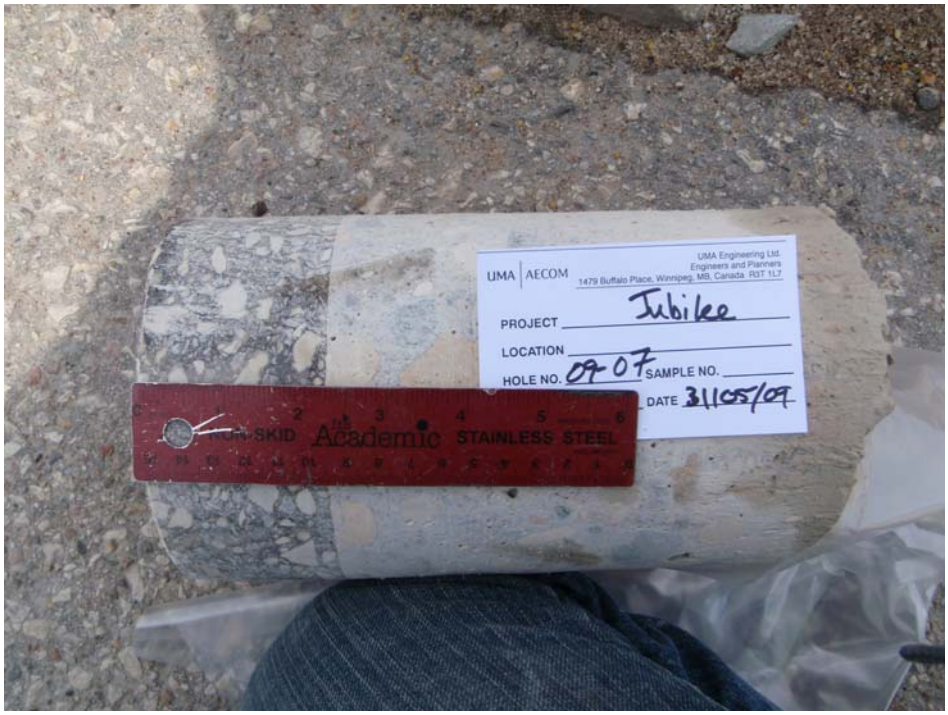


Photo 07: Pavement core at the location of TH 09-07

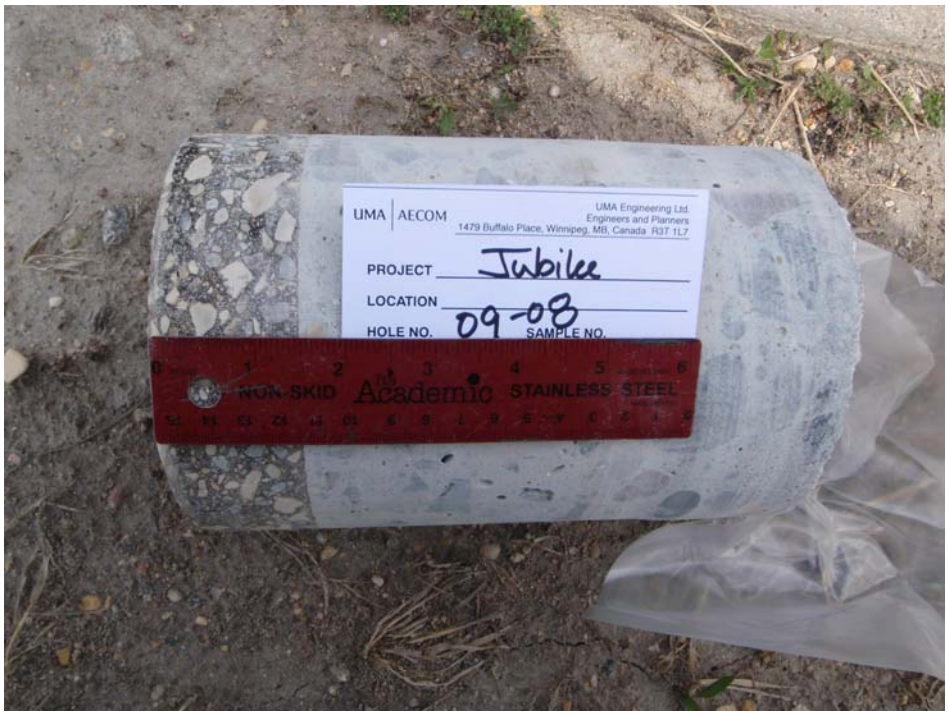
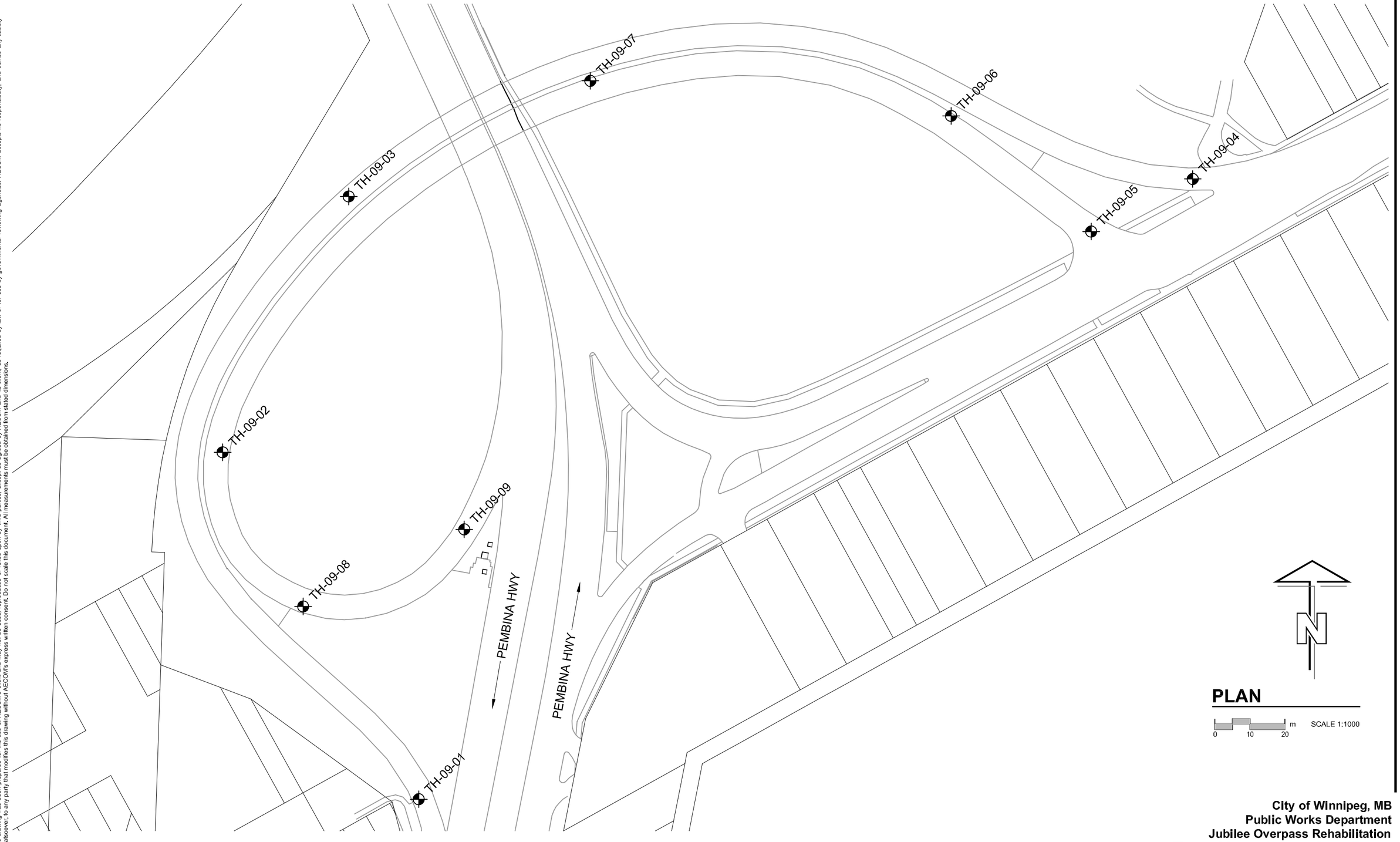


Photo 08: Pavement core at the location of TH 09-08

Photo 09: Pavement core at the location of TH 09-09



PLAN

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City of Winnipeg, MB
Public Works Department
Jubilee Overpass Rehabilitation

Test Hole Location Plan

AECOM

Figure - 4.1