



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 632-2011

**ELM PARK PEDESTRIAN BRIDGE – SUPERSTRUCTURE REHABILITATION AND
SOUTH ABUTMENT RELOCATION**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 ELM PARK PEDESTRIAN BRIDGE – SUPERSTRUCTURE REHABILITATION AND SOUTH ABUTMENT RELOCATION

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 11, 2011.

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

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

B3. SITE INVESTIGATION

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

B3.2 The Bidder is advised that prior to submission, he is to make himself fully acquainted with the extent of Work required and the nature of the Site.

B3.3 No claim shall be made by the Contractor, after Bid Submission is made or the Work is completed, that there was a misunderstanding as to his responsibility in securing for himself information relative to the nature or amount of Work to be done.

B4. ENQUIRIES

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

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

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

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

B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to 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 Form G2: Irrevocable Standby Letter of Credit and Undertaking, or a certified cheque or draft;
- B7.2 Further to B7.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B6.
- B7.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.
- B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.
- B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).
- B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his 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.

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

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

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

B10. QUALIFICATION

B10.1 The Bidder shall:

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

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

- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information

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

- B10.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
 - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
 - (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- B10.4 Further to B10.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
 - (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>)
- B10.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B10.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. BID SECURITY

- B11.1 The Bidder shall provide bid security in the form of:
- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
 - (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
 - (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.
- B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B11.1.2 All signatures on bid securities shall be original.
- B11.1.3 The Bidder shall sign the Bid Bond.
- B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B11.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

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

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

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

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

B12.1.1 Bidders or their representatives may attend.

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

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

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

B13. IRREVOCABLE BID

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

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

B14. WITHDRAWAL OF BIDS

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

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

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

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

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

B15. EVALUATION OF BIDS

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

- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation there from (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B10 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B6.

B15.2 Further to B15.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

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

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

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

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

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 Superstructure Rehabilitation of the Elm Park Pedestrian Bridge and Relocation of South Abutment located between Jubilee Avenue and Kingston Crescent, on Riverdale Avenue/Street.

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

- (a) Structural removals of existing timber curbs, steel fascia, handrails, deck drains, structural steel, timber decking, and asphalt overlay.
- (b) Supply and installation of modular block retaining wall, excavation, backfill, and grading.
- (c) Supply and installation of structural steel.
- (d) Construction of new concrete curbs, gutters and transition slabs.
- (e) Supply and installation of new deck drains.
- (f) Supply and Installation of new expansion joints.
- (g) Supply and installation of new aluminum pedestrian handrail and anchor units.
- (h) New asphaltic overlay.

D3. DEFINITIONS

D3.1 Refer to C0.1 for definitions.

D4. CONTRACT ADMINISTRATOR

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

Eric B. Loewen, P.Eng.
Project Manager
99 Commerce Drive
Winnipeg, Manitoba R3P 0Y7
Telephone No. (204) 477-5381
Facsimile No. (204) 284-2040

D4.2 At the pre-construction meeting, Eric B. Loewen will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D5. CONTRACTOR'S SUPERVISOR

D5.1 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.

D6. NOTICES

D6.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor

shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D4.1.

D6.3 Notwithstanding C21, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg
Chief Financial Officer

Facsimile No.: (204) 949-1174

D6.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

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

Facsimile No.: (204) 947-9155

D7. FURNISHING OF DOCUMENTS

D7.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

D8.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D9. SAFE WORK PLAN

D9.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D9.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>

D10. INSURANCE

D10.1 The Contractor shall provide and maintain the following insurance coverage:

- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a

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

- (b) 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;
- (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

D10.2 Deductibles shall be borne by the Contractor.

D10.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.

D10.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11. PERFORMANCE SECURITY

D11.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

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

D11.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D11.2 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D12. ENVIRONMENTAL PROTECTION PLAN

D12.1 The Contractor shall provide the Contract Administrator with an Environmental Protection 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.

D12.2 The Environmental Protection Plan should be prepared and submitted in conformance with the Government of Canada Department of Fisheries and Oceans' "Bridge Maintenance" requirements. These requirements may be seen on the Department's internet site at http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/prov-terr/mb/os-eo04_e.htm.

SCHEDULE OF WORK

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 the General Conditions for the return of the executed Contract.
- D13.2 The detailed work schedule shall consist of the following:
- (a) A Gantt chart for the Work based on the C.P.M. schedule; and
 - (b) acceptable to the Contract Administrator.
- D13.3 Further to D13.2(a), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

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 D8;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D9;
 - (iv) evidence of the insurance specified in D10;
 - (v) the performance security specified in D11;
 - (vi) the Environmental Protection Plan specified in D12; and
 - (vii) 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 City intends to award this Contract within ten (10) business days of tender close.
- D14.3.1 If the actual date of award is later than the intended date, the dates specified for Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D15. RESTRICTED WORK HOURS

- D15.1 The Contractor shall require written permission 48 hours in advance from the Contract Administrator for any Work to be performed between the hours of 8:00 p.m. and 7:00 a.m., or on Sundays, Statutory Holidays and or Civic Holidays. In addition, such Work shall conform with all applicable laws and/or by-laws and specifically the Noise Control By-Lay No. 2480/79.

D16. SUBSTANTIAL PERFORMANCE

- D16.1 The Contractor shall achieve Substantial Performance by December 9, 2011.
- D16.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D16.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D17. TOTAL PERFORMANCE

D17.1 The Contractor shall achieve Total Performance by June 8, 2012.

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

D17.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D18. LIQUIDATED DAMAGES

D18.1 If the Contractor fails to achieve Total Performance in accordance with the Contract by the day herein for Total Performance, the Contractor shall pay the City Five Hundred dollars (\$500) per Working Day for each and every Working Day following the day fixed herein for Total Performance during which such failure continues.

D18.2 The amount specified for liquidated damages in D18.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Total Performance by the day fixed herein for same.

D18.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D19. WORKING CONDITIONS ON RED RIVER

D19.1 Further to Clause C16, Force Majeur :

- (a) Should the river levels or ice conditions in the Red River prevent the South Abutment related earthworks and retaining walls from commencing, such that work could not be completed before winter, the contractor may request, in writing, that the Dates of Substantial and Total Performance be extended to October 15, 2012 and October 31, 2012 respectively, subject to approval of the Contract Administrator.
- (b) Should an extension be approved, there shall be no additional payment related to it.

CONTROL OF WORK

D20. JOB MEETINGS

D20.1 Regular bi-weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D20.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D21. OFFICE FACILITIES

- D21.1 The Contractor shall supply office facilities meeting the following requirements:
- (a) The field office for the Contract Administrator may be a shared facility with the Contractor.
 - (b) The building shall be conveniently located near the site of the Work.
 - (c) The building shall be suitable for all weather use. It shall be equipped with a heater so that the room temperature can be maintained between 16 – 18 °C.
 - (d) The building shall be adequately lighted with fluorescent fixtures.
 - (e) The building shall be furnished with minimum, one table 3m x 1.2m and a minimum of five (5) chairs, suitable for site meetings.
 - (f) A portable toilet shall be located near the field office building.
- D21.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

D22. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D22.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the ties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D23. AUTHORIZED WORK ON PRIVATE PROPERTY

- D23.1 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.

D24. LAYOUT OF THE WORK

- D24.1 The Contract Administrator will provide the basic centrelines and an elevation of the Works.
- D24.2 The Contractor shall be responsible for the true and proper layout 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.
- D24.3 The Contract Administrator shall be notified at least one (1) working day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.
- D24.4 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items used in giving 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.

D25. COOPERATION WITH OTHERS

- D25.1 The Contractor's attention is directed to the fact that other Contractor's, the personnel of Utilities and the staff of the City may be working on the structure, approach roadways, adjacent roadways or right-of-ways. 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 this Contract.

D26. ENVIRONMENTAL PLANNING

D26.1 The Contractor shall conduct his operations in accordance with all current federal, provincial or other regulations concerning environmental protection and pollution control. It shall be the Contractor's responsibility to familiarize himself with all applicable regulations and to obtain all necessary approvals and permits for his operations.

D27. RED RIVER NAVIGATION PROTECTION

D27.1 The Red River is open to navigation from approximately May 1st to mid-November, annually. During this period, it will be the responsibility of the Contractor to fully ensure the safety of river users. Also during this period, the contractor shall ensure that the dimensions of the navigation channel are not restricted in any way.

D27.2 Prior to commencing any Works or operations involving the use of equipment in or above the river, the Contractor must obtain in writing the clearance of the Winnipeg Rivers and Streams Authority Number One and of the Canadian Coast Guard (in accordance with the Navigable Waters Protection Act).

D27.3 The Contractor shall provide, install, and maintain adequate warning signs and lighting on the work bridges, cofferdams, work platforms, and bridge and buoys to notify boats and other craft navigating on the Red River that construction is underway. These warnings shall meet the requirements of the Winnipeg Rivers and Streams Authority Number One and of the Canadian Coast Guard.

D27.4 Prior to commencing any applicable operations over the Red River, the Contractor shall provide to the Contract Administrator a copy of all necessary approvals received by the Contractor.

MEASUREMENT AND PAYMENT

D28. PAYMENT

D28.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D29. WARRANTY

D29.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

_____ ,
(hereinafter called the "Principal"), and

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

_____ dollars (\$ _____)

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

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

BID OPPORTUNITY NO. 632-2011

ELM PARK PEDESTRIAN BRIDGE – SUPERSTRUCTURE REHABILITATION AND SOUTH ABUTMENT RELOCATION

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

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

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

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

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

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

_____ day of _____, 20____.

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D11)

(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 632-2011

ELM PARK PEDESTRIAN BRIDGE – SUPERSTRUCTURE REHABILITATION AND SOUTH ABUTMENT
RELOCATION

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)

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

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

<u>Specification No.</u>	<u>Specification Title</u>
E2.	Table of Contents
E3.	Verification of Weight
E4.	Geotechnical Report
E6.	Detailed Traffic Control
E7.	Pedestrian Protection and Accommodation
E8.	Structural Removals
E9.	Modular Block Retaining Wall
E10.	Site Excavation and Grading
E11.	Landscape Restoration
E12.	Geotextile
E13.	Rip Rap
E14.	Structural Steel
E15.	Concrete Repairs
E16.	Nail Laminated Deck
E17.	Bridge Deck Drains
E18.	Aluminum Pedestrian Handrail
E19.	Expansion Joint Seals
E20.	Asphalt Resurfacing Works
	Chain Link Fencing

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
B131-11-05	Cover Sheet
B131-11-06	General Arrangement
B131-11-07	Demolition
B131-11-08	Deck Plan
B131-11-09	Deck Sections
B131-11-10	Deck Details
B131-11-11	Deck Drain Details
B131-11-12	South Abutment
B131-11-13	Transition and Approach Slabs
B131-11-14	EMSEAL Joint Details
B131-11-15	Pedestrian Handrail Layout
B131-11-16	Pedestrian Handrail Details – Sheet 1
B131-11-17	Pedestrian Handrail Details – Sheet 2

E2. VERIFICATION OF WEIGHT

- E2.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.
- E2.1.1 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.
- E2.1.2 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:
- (a) Checking Contractor's scales for Consumer & Corporate Affairs certification seals.
 - (b) Observing weighing procedures.
 - (c) Random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale.
 - (d) Checking tare weights shown on delivery tickets against a current tare.
- E2.1.3 No charge shall be made to the Owner for any delays or loss of production caused by such inspection and verification.
- E2.2 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.
- E2.2.1 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:
- (a) upon which scale the truck or truck/trailer(s) combination was weighed.
 - (b) the mechanically printed tare weight.
 - (c) the license number(s) of the truck and trailer(s).
 - (d) the time and date of weighing.

E3. GEOTECHNICAL REPORT

- E3.1 Further to GC:3.1, the geotechnical report is provided to aid the Contractor's evaluation of the existing soil conditions at the South Approach to aid in the design of the Modular Retaining Wall. The geotechnical report is contained in Appendix 'A'.

E4. DETAILED TRAFFIC CONTROL

- E4.1 Description
- (a) The Work covered under this item shall include all operations related to establishing and executing the detailed 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.
- E4.2 Notification
- (a) The Contractor shall notify the City of Winnipeg Customer Service at 986-5640, one day in advance of any traffic lane closures.
- E4.3 Construction Methods
- E4.3.1 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 and 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.

E4.3.2 Specific

- (a) The bridge will be open for the duration of the rehabilitation Work, with the exception of up to five (5), one to two day closures for erecting steel stringers and asphalt paving works.
- (b) Set up working area perimeter and erect fencing to deter and prevent pedestrian traffic from entering the Work area as approved by the Contract Administrator.
- (c) Maintain minimum pedestrian walkway width of 1.8 m at all times on the bridge.
- (d) If the Work is to proceed in the spring/summer/fall months, pedestrian and vehicle access to the Bridge Drive Inn is to be maintained at all times.
- (e) Access to private residences shall be maintained at all times.

E4.4 Measurement and Payment

- (a) Detailed Traffic Control is considered incidental to the Works of Specification E5 and no additional measurement or payment will be made.

E5. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

- (a) The Work covered under this item shall include all operations related to mobilization and demobilization as hereinafter specified. It also includes supplying and installation of access/work platforms, scaffolding and debris collectors to prevent foreign materials from entering the waterway underneath the bridge.
- (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 mobilization and demobilization.

E5.2 Construction Methods

E5.2.1 Work Plan and Schedule

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any Work on Site, a detailed work plan and schedule, clearly illustrating the method and sequence by which he proposes to perform the substructure repairs, including a description of the measures that will be implemented to meet the environmental requirements.
- (b) The plan 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: work platforms; type and capacity of equipment; sequence of operations; design of demolition catch platforms / debris collectors; and description of the measures that will be implemented to meet the requirements of D12 - Environmental Protection Plan.

E5.2.2 Work Platforms

- (a) All work platforms to meet requirements of Manitoba Workplace Health & Safety.

E5.2.3 Mobilization

- (a) If required to access the site through a private property, ensure that the requirements in section D23 have been met.
- (b) Inform the Contract Administrator of the intended area for setting up site office, area for stocking piling, site access route and the intended move-in date.
- (c) Inform the Contract Administrator and request his presence during the move-in.

E5.2.4 Demobilization

- (a) Inform the Contract Administrator of the intended move-out date and confirm the exit route to use.
- (b) Ensure that all the excess construction materials have been removed from the site.
- (c) Restore the site office area, access route, the stockpiling areas, and all other areas used during the construction to their previous existing conditions or better as approved by the Contract Administrator.

E5.3 Measurement and Payment

- (a) Mobilization and demobilization will be paid for on a Lump Sum basis under "Mobilization and Demobilization," which price will be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) Mobilization and demobilization will be paid for at a percentage of the Contract Lump Sum Price for "Mobilization and Demobilization" specified as follows:
 - (i) 30% when the Contract Administrator is satisfied that construction has commenced.
 - (ii) 60% when Substantial Performance has been met.
 - (iii) 10% upon completion of the project.

E6. PEDESTRIAN PROTECTION AND ACCOMMODATION

E6.1 Description

E6.1.1 This Specification shall cover the provision of protection and guidance for pedestrians crossing Elm Park Bridge from all construction operations during the entire period for the work of this Contract, as specified herein.

E6.1.2 The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E6.2 Materials for Protection and Guidance Requirements

E6.2.1 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.

E6.2.2 Temporary Pedestrian Handrails

- (a) Provide Temporary Pedestrian Handrails designed in accordance with the Canadian Highway Bridge Design Code (CHBDC) S6-06.

E6.2.3 Temporary Pedestrian Sidewalk

- (a) The temporary pedestrian sidewalk shall be a minimum of 1800 mm wide with a non-slip type of finish suitable for use as a sidewalk. The temporary pedestrian sidewalk shall extend sufficiently from the South Approach and beyond to tie into the existing concrete sidewalks beyond the bridge.

E6.3 Construction Methods

E6.3.1 Scope of Work

- (a) It is intended that the Contractor provide, at all times during the project, Pedestrian and Traffic Protection and Guidance involving:
 - (i) Supply (as applicable), erection and maintenance of pedestrian protection, temporary handrails, and pedestrian sidewalk throughout the various stages of the Work as specified herein.
 - (ii) Provision of all signage necessary to direct pedestrian traffic.
 - (iii) Provision of adequate security on the bridge (security /gates).
 - (iv) Provision of all other measures necessary to ensure safe pedestrian access across the bridge to the satisfaction of the Contract Administrator.

E6.3.2 Pedestrian Protection and Temporary Sidewalk

- (a) Installation/Removal of Temporary Sidewalk
 - (i) The pedestrian sidewalk shall be erected prior to the commencement of any work that would affect pedestrian traffic and to the satisfaction of the Contract Administrator.
 - (ii) The pedestrian protection, temporary handrails, and temporary pedestrian sidewalk shall provide a walkway to direct the pedestrian traffic past the work area as shown on the Drawings. The pedestrian protection shall be securely anchored at all times while work is being performed.
- (b) Shop Drawings
 - (i) At least seven (7) working days prior to the scheduled commencement of any fabrication, the shop drawings shall be submitted to the Contract Administrator for his review.
 - (ii) The shop drawings shall consist of: three (3) sets of prints, one (1) reproducible sepia set.
 - (iii) The shop drawings shall clearly show materials, dimensions, details, connections, accessories, and design loads and shall be stamped by a Professional Engineer registered in the Province of Manitoba.
 - (iv) The Contractor shall determine the work area extents and the associated pedestrian protection, temporary handrails, and temporary sidewalks required throughout the various stages of the Work prior to submission of the pedestrian protection and temporary sidewalk shop drawings.

(c) Safety Precautions

- (i) 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 statutes and laws in force in Manitoba applicable to the work of this nature.

E6.3.3 Maintenance of the Pedestrian Protection, Temporary Handrails and Temporary Sidewalk

- (a) The Contractor shall maintain the pedestrian protection, temporary handrails, and temporary sidewalk in good working order at all times to the satisfaction of the Contract Administrator. Any item exhibiting rips, breakage or other defects shall be promptly repaired or replaced.
- (b) The walkway shall be kept free of all construction materials, debris and equipment at all times.

E6.4 Measurement and Payment

- (a) Pedestrian and traffic protection/accommodation will be paid for on a Lump Sum basis, pro-rated on a weekly basis over the construction period, and no measurement will be made for this work. The payment will be considered full payment for supply of all materials and performing all operations herein described and all other items are incidental to the Work.
- (b) Pro-rated payment will be based on the following breakdown:
 - (i) Installation 40%
 - (ii) Maintenance 30%
 - (iii) Removal 30%

E7. STRUCTURAL REMOVALS

E7.1 Description

- (a) This Specification shall cover structural removal works, including all necessary staging, demolition, removal, transporting, unloading, stockpiling, dismantlement, disposal, salvage, and reinstallation 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.

E7.2 Equipment

E7.2.1 General

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

E7.3 Construction Methods

E7.3.1 Scope of Work

- (a) The work under this Specification shall include the following items, to the limits as shown on the Contract Drawings or as otherwise directed by the Contract Administrator.
 - (i) Timber Curb Removals – removal and disposal of all timber curb works to the limits shown on the drawings;
 - (ii) Asphalt Removals – removal and disposal of all asphalt works to the limits shown on the drawings.
 - (iii) Steel Removals – removal and disposal of all steel works to the limits shown on the drawings including Pedestrian handrail, sidewalk brackets, stringers, girders, fascia and deck drains.

- (iv) Miscellaneous Metals – miscellaneous removals and disposal of such items as rivets, angles, brackets and plates for the work of this Contract shall be incidental to the Work for which such removals are required, whether or not specifically identified in the Specifications. No separate measurements or payments will be made for such items.
- (v) Expansion Joints – removal and disposal of all expansion joints to the limits shown on the drawings.
- (vi) Timber Deck Removals – removal and disposal of all timber deck works to the limits shown on the drawing and as directed by the Contract Administrator after asphalt removal.
- (vii) Steel Lamppost – removal and reinstallation of steel lamppost on South Approach span and New South Abutment. Contractor to coordinate with Manitoba Hydro. Light pole base to be supplied by Others.
- (viii) Navigation Lights – removal and reinstallation of navigation lights. Contractor to coordinate with Manitoba Hydro.

E7.3.2 Fees and Permits

- (a) The Contractor shall obtain and pay for all licenses and permits necessary for the removal work.
- (b) The Contractor shall comply with all Municipal, Provincial, and Federal Government regulations relating to the demolition of structures.

E7.3.3 Explosives

- (a) The use of explosives is prohibited.

E7.3.4 Protection of Existing Structures and Services

- (a) The Contractor shall prevent movement, settlement, or damage of existing structures to remain, services, paving, trees, landscaping and adjacent grades. The Contractor shall provide bracing, shoring and underpinning as required and shall have this work certified by a Professional Engineer registered to practice in the Province of Manitoba employed by the 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.

E7.3.5 Safety Precautions

- (a) The Contractor shall provide flagmen, guards, barricades, railings, and necessary warning lights and whenever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or other construction, to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial Statutes applicable to the work. The Contractor shall provide all other protective measures as may be required by any law in force in Manitoba and the Canada Labour Code.
- (b) Verify location of existing services, utilities and structures within the Site.

E7.3.6 Traffic and Pedestrian Control

- (a) Traffic and pedestrian control shall conform to E6, Pedestrian Protection and Accommodation.

E7.3.7 Structure Removal Schedule and Procedures

- (a) At least fourteen (14) working days prior to the scheduled commencement of any demolition and removal work, the Contractor shall submit to the Contract Administrator details of the proposed equipment, schedule, and methods of removal for each type of demolition or removal for review and acceptance. No demolition and removal works shall commence without prior acceptance of the Contract Administrator.
- (b) 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 pedestrians, 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.

- (c) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.
- (d) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on-site will be allowed without written approval of the Contract Administrator.
- (e) It shall be the Contractor's responsibility to find suitable disposal areas away from the site.
- (f) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any roadways or into the Red River during removal operations.
- (g) 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.
- (h) Expose, support, protect, relocate or remove and replace as required by and in a manner acceptable to the owner, existing services, utilities and structures that are indicated in the Specifications or shown on the Drawings as being adjacent to the Work.

E7.3.8 Structural Removal Methods

- (a) General
 - (i) Structural removals shall be deemed to include all the items of work as listed under Clause E7.3.1 "Scope of Work", of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.
 - (ii) 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.
- (b) Access/Work Platforms
 - (i) The Contractor shall provide all necessary access/work platforms to facilitate structural removals and subsequent inspection of all the works by the Contract Administrator.
- (c) Details of Existing Structures
 - (i) 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 of 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.
- (d) Protection of Roadways and Walkways
 - (i) 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.
- (e) Asphalt Removals
 - (i) The Contractor shall only use methods of asphalt removal that will not damage the existing structure to remain or new structures.
- (f) Steel Removals

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

(g) Wood Removals

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

E7.4 Measurement and Payment

E7.4.1 Structural Removals

- (a) Structural Removals, except for timber deck, shall be paid for on a Lump Sum basis for the "Items of Work" listed herebelow, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work. No measurement will be made for this Work.
- (b) Items of Work:
 - (i) Structural Removals
 - Timber Curb Removals
 - Asphalt Removals
 - Steel Removals
 - Expansion Joint Removals
 - Timber Deck Removals
 - Steel Lamppost Removal and Reinstallation
- (c) Timber deck removals will be paid for at the Contract Unit Price per square metre, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

E8. MODULAR BLOCK RETAINING WALL

E8.1 Description

- (a) This specification shall cover all operations related to the supply and installation of modular block retaining walls, as herein specified.
- (b) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all work hereinafter specified.

E8.2 Materials

E8.2.1 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful, safe, and workmanlike manner to the satisfaction of the Contract Administrator.
- (b) Concrete blocks to be Allan Block Retaining Wall AB Stone units available through CCI Industries, or approved equal. Colour to be approved by the Contract Administrator.
- (c) Geogrid products shall be of high density polyethylene or polyester yarns encapsulated in a protective coating specifically fabricated for use as a soil reinforcement material.

E8.2.2 Granular Backfill

- (a) Footing and wall backfill shall be compacted granular base course material, 19mm, in accordance with requirements of base course material specified in CW 3110-R9.
- (b) Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB 8.1 CAN/CGSB 8.2.

- (c) Granular backfill to extend from Modular Block Retaining Wall to existing South Abutment.

Sieve Designation	% Passing
19 mm	100
16 mm	80-100
4.75 mm	40-70
2.00 mm	25-55
0.425 mm	15-30
0.075 mm	8-12

- (d) Liquid limit: to ASTM D4318, maximum 25.
(e) Plasticity index: to ASTM D4318, maximum 6
(f) Los Angeles degradation: to ASTM C131. Max. % loss by weight: 35
(g) Crushed particles: at least 50% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face.

E8.2.3 Clay Backfill

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

E8.2.4 Drainage Stone

- (a) The drainage stone shall be a free draining angular granular material of uniform particle size smaller than 19 mm (3/4 inch) and less than 5% fines (0.08 mm diameter) separated from the retained soil by a geotextile filter. The drainage soil shall be installed directly behind the Modular Retaining Wall units. The individual particles shall be dense, durable, and resistant to breakdown from freezing effects. The material shall be free of organics and other deleterious material.

E8.2.5 Drainage Pipe

- (a) The drainage pipe shall be perforated corrugated HDPE or PVC pipe, with a minimum diameter of 100 mm (4 inches), protected by a geotextile filter to prevent the migration of soil particles into the pipe, or as specified on the construction drawings. Provide a minimum of 2% slope for pipe layout.

E8.2.6 Compressible Expanded Polystyrene Foam

- (a) The compressible expanded polystyrene shall be Ethofoam 180 or approved equivalent.

E8.3 Submittals

- (a) Contractor to submit sealed design drawings and calculations to Contract Administrator for review no later than 2 weeks prior to wall installation. Retaining wall design to be in accordance with recommendations in Appendix A - Geotechnical Report. Details to include:
- (i) Plan of entire length of wall,
 - (ii) Elevation of wall indicating top and bottom of wall elevations,
 - (iii) Sections through walls,
 - (iv) All vertical and horizontal break points and running dimensions to break points,
 - (v) Designation of type and size of blocks including caps,
 - (vi) Limits and extent of reinforced fill volume,
 - (vii) Length, size, type and elevation of every layer of geogrid reinforcement,
 - (viii) Running dimension to changes in length of the geogrid reinforcement,

- (ix) The original and final ground elevations,
 - (x) Location of drain lines within geogrid reinforcement, and
 - (xi) General notes required for construction.
- (b) Samples of modular concrete blocks and soil reinforcing materials to be submitted 2 weeks prior to wall installation.

E8.4 Construction Methods

- (a) Compact subgrade to minimum 95% of standard proctor density prior to placement of wall foundation/base course material.
- (b) Granular base to be compacted to thicknesses indicated on the sealed design drawings and specified in CW3110 except that layers shall not exceed 150 mm of compacted thickness.
- (c) Compact reinforced backfill to 95% of standard proctor density.
- (d) Moisture content of backfill material before and during compaction shall be uniformly distributed throughout each layer and shall be within about 3% of optimum.
- (e) Only lightweight, hand operated compaction equipment shall be allowed within 600 mm of the face of the concrete units.
- (f) Tracked construction equipment shall not be operated directly upon geogrid reinforcing on within 1 m of concrete units. Minimum fill thickness of 150 mm is required prior to operation of tracked vehicles over geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing fill and damaging the geogrid.
- (g) Any damage to the geogrid reinforcing or other components of the wall caused the Contractor shall be repaired at the Contractor's expense.
- (h) Minimize cutting block. Cut exposed block with power driven abrasive cutting disc or diamond cutting wheel for flush-mounted electrical outlets, grilles, pipes, conduit, leaving 3.0 mm maximum clearance.

E8.5 Measurement and Payment

E8.5.1 Modular Block Retaining Wall

- (a) Modular Block Retaining Wall will be paid for at the Contract Lump Sum price for "Modular Block Retaining Wall", which price shall be payment in full for supplying all materials and performing all operations herein described and all other items included in the Work in this Specification. No measurement will be made for this Work.

E9. SITE EXCAVATION AND GRADING

E9.1 Description

- (a) This Specification covers grading works and shall amend and supplement Standard Specification CW 3170-R3.
- (b) The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E9.2 Construction Methods

- (a) Excavation and grading shall be to the elevations and grades as shown on the Drawings.
- (b) Excavation and grading shall include the removal and disposal of snow, deleterious materials and debris from work area.
- (c) The Contractor shall remove and dispose of any existing rip rap or other erosion protection at the discretion of the Contract Administrator.

- (d) Excavated material, as approved by the Contract Administrator, may be used for backfill and grading purposes excluding deleterious material such as snow, frozen soil, roots, tree trunks, and rubble. Fills shall be compacted to a minimum of 95 percent of the Standard Proctor Maximum Dry Density as determined by ASTM D698.
- (e) Backfill material for concrete abutment and timber wingwall removals shall be clay or native backfill material as approved by the Contract Administrator.

E9.3 Measurement and Payment

- (a) Excavation and grading will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres (m³) excavated below original ground surface, in accordance with this specification as computed from measurements verified by the Contract Administrator. No separate measurement or payment shall be made for fill placed above original ground to achieve design grades. Payment shall be at the Contract Unit Price for "Excavation and Grading".

E10. LANDSCAPE RESTORATION

- E10.1 Restore all landscaping to a condition equal to that which existed before the work started. This may be accomplished by sodding or seeding. Maintenance or landscape restoration will be in accordance with CW 3510-R7 and CW 3520-R5.
- E10.2 Construct 600 mm deep treated timber tree wells around existing trees to the limits shown on the drawings. Treated timber to be 150 mm x 150 mm, connected with galvanized lag screws in accordance with E15 "Nail Laminated Deck".
- E10.3 Landscape restoration will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Landscape Restoration" performed in accordance with this Specification and accepted by the Contract Administrator. Payment will be in accordance with:
 - (a) Seventy-five (75) percent of following supply and placement
 - (b) Twenty-five (25) percent following termination of the maintenance period

E11. GEOTEXTILE

E11.1 Description

- E11.1.1 This Specification covers the supply and installation of the geotextile fabric and shall amend and supplement Standard Specification CW 3130-R2. Sub clauses 2.1 to 2.4, 3.5 to 3.10 and 4.3 apply
- E11.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E11.2 Materials

- E11.2.1 Sand base material shall be of type accepted by the Contract Administrator.
- E11.2.2 The geotextile shall be a non-woven geotextile fabric, meeting or exceeding the following properties:
- E11.2.3

NON-WOVEN GEOTEXTILE PROPERTIES			
	ASTM Test Method	Units	Minimum Average Roll Values
PHYSICAL			
Grab Tensile Strength	D-4632	N	890
Grab Tensile Elongation	D-4632	%	50
Mullen Burst	D-3786	kPa	2750
Puncture	D-4833	N	575
Trapezoidal Tear	D-4533	N	355
UV Resistance	D-4355	% @ hrs ¹	70/500
HYDRAULIC			
Apparent Opening Size	D-4751	mm	0.150
Permittivity	D-4491	sec ⁻¹	1.4
Flow Rate	D-4491	L/sec/m ²	54

¹ Percent grab tensile strength retained per hours of UV exposure following conditioning in accordance with ASTM D-4355.

E11.3 Construction Methods

- E11.3.1 Geotextile fabric shall be installed beneath the rip-rap as shown on the Drawings.
- E11.3.2 Installation, handling and storage of geotextile fabric shall conform to the manufacturer's recommendations.
- E11.3.3 If more than one piece of fabric is used to cover the ground surface the joints shall be overlapped by 0.6 m, in a shingle pattern, with the up-slope pieces overlapping the down-slope pieces and the up-stream pieces overlapping the down-stream pieces.
- E11.3.4 Tears or other damage in the geotextile fabric shall be repaired with a piece of geotextile fabric placed over the damaged area and extending 1.0 m in all directions beyond the damaged area. Damaged or torn geotextile shall be replaced or repaired at the Contractors expense.

E11.4 Measurement and Payment

- E11.4.1 Geotextile fabric will be measured on an area basis. The area to be paid for shall be the total number of square metres of geotextile fabric installed in accordance with this Specification as computed from measurements verified by the Contract Administrator. Payment shall be at the Contract Unit Price for "Supply and Placement of Geotextile".

E12. RIP-RAP

E12.1 Description

- E12.1.1 This Specification covers all operations necessary for placing rip-rap, as erosion protection, along the river banks and around the piers and the existing outfall at the north riverbank, as shown on the drawings or determined by the Contract Administrator. This Specification amends and supplements Standard Specification CW 3615.
- E12.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E12.2 Materials

- E12.2.1 Rip-rap shall be manufactured from hard, durable limestone or dolomite that is resistant to the action of water and frost and suitable in all respects for the purpose intended. The rock shall meet the following physical requirements:
 - (a) Class 350, well graded having a full range of and even distribution of sizes;

- (b) minimum bulk specific gravity of 2.6 (ASTM C127);
- (c) maximum Los Angeles abrasion loss of 35% (ASTM C131);
- (d) maximum soundness loss of 18% (ASTM C88);
- (e) maximum absorption of 2.5% (ASTM C127); and
- (f) maximum moisture content of 3 percent by weight (ASTM D2216-98).

E12.2.2 Acceptance of Material

- (a) The Contractor shall supply a representative sample, or provide access to the quarry manufacturing the rip-rap at least ten (10) Business Days prior to the commencement of the Construction.
- (b) The Contractor shall submit the proposed supplier and location of the rock and confirm that sufficient quantity of specified rock is available at least (10) Business Days prior to the commencement of the Construction
- (c) The Contract Administrator shall perform the necessary tests to determine compliance with the specified properties.

E12.3 Construction Methods

E12.3.1 Rip-rap shall be installed to the elevations, grades, thickness and dimensions as shown on the Drawings, or as directed by the Contract Administrator.

E12.3.2 Rip-rap shall be placed in a manner that prevents damage to the geotextile.

E12.3.3 Rip-rap shall be placed in a manner such that larger pieces are uniformly distributed, smaller rocks fill the spaces between the larger rocks, and that excessive segregation of the various rock sizes does not occur.

E12.4 Measurement and Payment

E12.4.1 Supply and installation of rip-rap will be measured and paid for on a weight basis. The weight to be paid for shall be the total number of Tonnes of riprap delivered and placed in accordance with this Specification and as accepted by the Contract Administrator. Payment shall be at the Contract Unit Price "Supply and Placement of Rip-rap".

E13. STRUCTURAL STEEL

E13.1 Description

- (a) This Specification shall cover the supply, fabrication, transportation, handling and erection of structural steel and all incidental structural steel elements, components and fasteners, 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 herein specified and as indicated on the Drawings.

E13.2 Materials

E13.2.1 General

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

E13.2.2 Structural Steel

- (a) All structural steel and incidental structural steel elements shall conform to the requirements of CSA Standard CAN/CSA - G40.21-04, Grade 350W.
- (b) Plate steel from coils will not be permitted.
- (c) Edges of all plates shall be subject to visual inspection, and any plates found to include laminations shall not be used on the Work.

E13.2.3 Hot-Dip Galvanizing

- (a) All steel items supplied under this Specification shall be hot-dipped galvanized in accordance with CSA Standard G164-M92 to a retention of 610 gm/m² after fabrication unless specified otherwise.

E13.2.4 Galvanizing Touch-Up

- (a) Field-applied galvanizing, to touch up damaged hot-dipped galvanizing on-site and to galvanize filed welds, shall be done with Zinga or Zinc metalizing.

E13.2.5 Welding Consumables

- (a) Welding consumables for all processes shall be certified by the manufacturer as complying with the requirements of CSA Standard W59-03 and the following specifications:
 - (i) Manual, Shielded Metal Arc Welding (SMAW);
 - (ii) (All electrodes for manual, shielded metal arc welding shall conform to CSA W48.1-M1991, CSA W48.3-93 classification E480XX or imperial equivalent;
 - (iii) Gas, Metal Arc Welding (GMAW);
 - (iv) All electrodes used in the gas, metal arc-welding process shall be composite electrodes conforming to CSA W48.4-95 classification ER480S-X or imperial equivalent.
 - (v) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.
 - (vi) Submerged Arc Welding (SAW):
 - (vii) Welding electrodes and fluxes used in the submerged arc welding process shall conform to CSA W48.6-1996 classification F480X-EXXX or imperial equivalent.
 - (viii) 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 review at least fourteen (14) Calendar 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.

E13.2.6 High-Strength Bolts, Nuts, Washers, and Shear Studs

- (a) All permanent high-strength bolts shall be hot-dipped galvanized and shall conform to the requirements of ASTM Specification A325, Type 1. Nuts shall be hot-dipped galvanized and conform to the requirements of ASTM Specification A563, Grade DH. Washers shall be hot-dipped galvanized and conform to the requirements of ASTM Specification F436, Type 1. Shear Studs shall be hot-dipped galvanized and shall conform to the requirements of ASTM Specification A1044.

E13.3 Equipment

- E13.3.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E13.4 Construction Methods

E13.4.1 Scope of Work

- (a) It is intended that this Specification covers the following structural steel Works including all components and related fasteners:
 - (i) New exterior stringers;
 - (ii) Strengthening of floor beam at South Approach; and
 - (iii) Replacement of interior stringer in South Approach span.

E13.4.2 Fabrication

(a) General

- (i) Except as otherwise specified herein, steel Work shall be fabricated in accordance with the latest A.W.S. Specification D1.1 and subsequent revisions. Fabrication shall be in accordance with the latest AASHTO LRFD Bridge Design and Construction Specifications and all subsequent revisions.
- (ii) No fabrication or welding of steel Work shall commence until permission to do so has been received from the Contract Administrator.
- (iii) The procedure for the repair of any members damaged during fabrication shall be accepted by the Contract Administrator prior to any Work taking place.

(b) Submissions

- (i) At least fourteen (14) Calendar Days prior to the scheduled commencement of any fabrication, the qualifications of Contractor, the qualifications or operators, the shop drawings, mill certificates shall be submitted to the Contract Administrator for his review.
- (ii) At least fourteen (14) Calendar Days prior to the scheduled installation of structural steel, the installation methods and equipment shall be submitted to the Contract Administrator for his review.

(c) Shop Drawings

- (i) Submit Shop Drawings as per CW1110.
- (ii) The shop drawings shall clearly show shapes, weights, dimensions, details, connections (including proper AWS welding identification), bolt holes, accessories and erection procedures.
- (iii) The Contractor shall field measure all dimensions as required prior to submission of the structural steel shop drawings.

(d) Preparation of Material

(i) Straightening Material

Prior to being used in fabrication, all structural steel shall be straight and free from kinks or bends. The flatness tolerance of plate in excess of 1 m wide shall be in accordance with the tolerance of the finished product as stated in Clause E11.4.2(p). If straightening is necessary, it shall be done by methods that will not injure the metal. The steel shall not be heated unless permission is given by the Contract Administrator. Sharp kinks and bends will be cause for rejection of the steel.

(ii) Edge Preparation for Welding

The edges of plates or sections which are to be welded together shall be prepared by sawing, shearing, flame-cutting, machining, chipping or arc air gouging to the details shown on the shop drawings. Surfaces and edges to be welded shall be smooth, uniform and free from fins, tears, cracks, and other defects which would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free from loose scale, slag, rust, grease, moisture or other material that will prevent proper welding. Mill scale that withstands vigorous wire brushing, a light film of drying oil or a thin rust-inhibitive coating may remain, except that all mill scale shall be removed from the surfaces on which welds are to be made by submerged arc welding or by shielded metal arc welding with low hydrogen electrodes. Surfaces within 50

mm of any weld location shall be free from any paint or other material that would prevent proper welding or produce objectionable fumes while welding.

- (e) Bolt Holes
 - (i) All holes for high strength bolts shall be either subpunched to a maximum of 22 mm and reamed, or drilled, and shall be of a nominal diameter not more than 2 mm in excess of the nominal bolt diameter.
 - (ii) Reamed holes shall be cylindrical and perpendicular to the member. Where practicable reamers shall be directed by mechanical means. Reaming shall be done with twist drills.
 - (iii) Drilling shall be done with twist drills. Burrs on the outside surfaces shall be removed.
 - (iv) Poor matching of holes will be cause for rejection.
- (f) Shear Connector Studs
 - (i) Welding of shear connector studs shall conform to the requirements of CSA Standard W59-M1989, Section 3.1.22 and 5.5.6.
- (g) Assembly and Welding Sequences
 - (i) If requested by the Contract Administrator, the Fabricator shall supply full details of the proposed assembly and welding sequence of any particular weldment.
- (h) Marking
 - (i) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system acceptable to the Contract Administrator.
- (i) Assembly
 - (i) The shop assembly of the various components of the weldments shall be executed in accordance with A.W.S. D1.1 Subsections 3.3 and 3.4.
- (j) Preheat and Interpass Temperatures
 - (i) No welding shall be done when the ambient temperature is lower than -20°C.
 - (ii) At temperatures below 0°C, the steel shall be preheated to a temperature of at least 10°C in excess of that stated in Table 1.
 - (iii) Preheat shall be applied to all steel to be welded so that the steel within 80 mm of the weld is heated to the temperature shown in Table 1.
 - (iv) Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.
 - (v) For all welding processes, preheat and interpass temperatures shall be maintained during welding, at temperatures not less than stated in Table 1.

Table 1	
Minimum Preheat and Interpass Temperatures	
Thickness of Thickest Part at Point of Welding	CSA Standard W59-M1989 Grade 350WT
Less than 19 mm	10°C
19 mm to 38 mm	10°C

- (vi) Preheat temperatures above the minimum shown in Table 1 may be required for highly restrained joints if designated by the Contract Administrator.
- (vii) Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.
- (viii) Preheat requirements for tack welds shall be as in the above table except that where single pass tack welds are used and are to be incorporated and

consumed in a weld made by the submerged arc and the gas metal arc processes, preheat is unnecessary.

- (k) Welding
 - (i) Welding shall be done by the manual, shielded metal arc, gas shielded metal arc or submerged arc processes in accordance with the approved procedures and A.W.S. D1.1 Section 4, Technique.
 - (ii) All welding shall be done under cover and, in the case of gas metal arc welding, shall be done in an area free from wind or draft.
- (l) Weld Profiles
 - (i) Weld profiles shall meet the requirements of CSA Standard W59-03 Clause 5.9.
- (m) High-Strength Bolt Installation
 - (i) Installation of high-strength bolts shall be in accordance with "AASHTO Standard Specifications for Highway Bridges - 1996, Division II, Clause 11.5 - Assembly" turn of the nut method.
 - (ii) Sufficient bolts, nuts and washers shall be furnished to complete the entire structure with an ample surplus to replace all bolts damaged or lost.
- (n) Machined Surface
 - (i) Machine finished surfaces, as designated on the Drawings, shall be coated with an accepted protective compound.
- (o) Dimensional Tolerances
 - (i) Members and parts of members shall be straight, true to line, and free from twists and bends. In determining acceptability under these general requirements, the tolerances stated herein after shall be applied.
 - (ii) The maximum deviation from the specified length measured on centreline of web: ± 6 mm.
- (p) Shipping
 - (i) Structural members shall be loaded in such a manner that they can be transported and unloaded at their destination without being excessively stressed, deformed or otherwise damaged.
 - (ii) All necessary haulage permits shall be obtained by the Contractor from the proper authorities prior to transportation by vehicles of any structural members.

E13.4.3 Erection

- (a) Erection of Structural Steel
 - (i) The Contractor shall obtain the Contract Administrator's acceptance on erection procedures and scheduling prior to the commencement of erection of structural steel.
 - (ii) The Contractor shall furnish, construct and subsequently dismantle and remove off-site, all falsework including working bridge required for the erection of the steelwork. Falsework shall be designed by the Professional Engineer registered in the Province of Manitoba and employed by the Contractor.
- (b) Erection Methods and Equipment
 - (i) At least fourteen (14) Calendar Days prior to the scheduled commencement of any steel erection on site, the Contractor shall submit to the Contract Administrator, the proposed schedule, methods and sequence of operations for review.
- (c) Handling and Storing Materials
 - (i) Material to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. Caution shall be exercised when storing structural steel which is exposed to weather or condensation to prevent local corrosion which may develop in areas where water is trapped. Coating with a water-

soluble oil after fabrication may be used to avoid this problem. Long members shall be supported on skids placed near enough to prevent injury from deflection. The Contractor shall be responsible for the loss of any material while in his care, or for any damage to it.

(d) Field Assembly

- (i) The parts shall be accurately assembled as shown on the Drawings and any match marks shall be followed. Hammering which will injure or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.
- (ii) Field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins) before final bolting. Fitting-up bolts shall be the same nominal diameter as the high strength bolts, and cylindrical erection pins shall be 1 mm larger.

(e) Straightening Bent Material

- (i) The straightening of plates and angles or other shapes shall be done by methods that will not produce fracture or other injury. The metal shall not be heated unless permitted by the Contract Administrator, in which case the heating shall not be to a higher temperature than that producing a "dark cherry red" colour. After heating, the metal shall be cooled as slowly as possible.
- (ii) Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture, and if necessary, replaced or repaired to the satisfaction of the Contract Administrator.

(f) Bolting

- (i) All field connections shall be bolted with high-strength bolts with the head side of the bolt on the exterior side of the connections. Bolting with high-strength bolts shall be carried out in accordance with "AASHTO Standard Specifications for Highway Bridges - 1996, Division II, Clause 11.5 - Assembly" turn of nut method.

(g) Splice Connections

- (i) Galvanized surfaces at splice connection locations shall be hand-wire brushed prior to installing bolted splices, as directed by the Contract Administrator.

(h) Misfits

- (i) The correction of minor misfits involving harmless amounts of reaming, cutting and chipping as determined by the Contract Administrator will be considered a legitimate part of erection. However, any error in shop fabrication which prevents the proper assembling and fitting-up of parts by the moderate use of drift pins or by a moderate amount of reaming and slight chipping or cutting, shall be the responsibility of the Contractor.

(i) Damage to Substructure

- (i) The substructure shall be carefully protected during erection of the structural steel by the Contractor. All concrete surfaces and corners liable to damage shall be protected with wood blocking, sacking, or other means, to prevent damage and chipping of concrete due to wire ropes, swing loads, or other activities. The Contractor shall repair any such damage to the satisfaction of the Contract Administrator at his own cost.
- (ii) The erection of structural steel shall be done so that there shall be no forces applied to cause overstressing of the piers.

(j) Welding to Galvanized Metal

- (i) All galvanizing should be removed from prepared surfaces to be field welded.
- (ii) After field welding the metal shall be touched up by the Galvanizing Touch-up Process in accordance with Clause E13.4.4(k) of these Specifications. All repairs shall be made flush with adjacent metal.

(k) Galvanizing Touch-up Procedure

- (i) Any areas of damaged galvanizing, and all field welds, are to receive fieldapplied galvanizing, in accordance with manufacturer of Zinga for two coats of Zinga or Zinc metalizing in accordance with E14.

E13.5 Quality Control

E13.5.1 Inspection

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

E13.5.2 Access

- (a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E13.5.3 Qualifications of Contractor

- (a) The Contractor shall produce evidence that his plant is recently fully approved by the C.W.B. to the requirements of CSA Specification W47.1-09, Division 1 or 2.1.

E13.5.4 Qualifications of Operators

- (a) The Contractor shall produce evidence that all welding operators to be employed on the Work are currently qualified by the C.W.B. at the time of fabrication and in the processes in which they are to be employed on the Work. Such qualification shall have been issued within two (2) years of the commencement of fabrication.
- (b) The Contractor shall also produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six-month period previous to the award of this Contract.

E13.5.5 Welding Procedures

- (a) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
- (b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.
- (c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding
- (d) The use of gas welding will be limited to light structural elements.

E13.5.6 Quality and Details of Welds

- (a) The quality and details of welds shall be in accordance with CSA Standard W59-03, Clause 12.5.4.
- (b) Welds shall have no cracks, inadequate penetration or lack of fusion, and shall have no other defects exceeding the limits in size and frequency of occurrence as specified in CSA Standard W59-03, Clause 12.5.4. Fusion type defects referred to in the Clause shall be interpreted as slag inclusions and similar generally elongated defects.

E13.5.7 Material Storage and Care

- (a) Steel
 - (i) Structural material, either plain or fabricated, shall be stored above the ground upon platforms, skids or other supports. It shall be kept free from dirt and other

foreign matter, and shall be protected, as far as practical, from corrosion. Long members shall be supported on skids placed near enough together to prevent injury from deflection.

- (ii) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system acceptable to the Contract Administrator.

(b) Welding Consumables

- (i) All electrodes having low hydrogen coverings shall be dried for at least 2 hours between 230°C and 260°C, before they are used. Electrodes shall be stored immediately after drying in storage ovens held at a temperature of at least 120°C. Electrodes that are not used within 4 hours after removal from a drying or storage oven shall be redried before use. Electrodes that have been wet shall not be used.
- (ii) Electrode wire used in submerged arc welding and gas metal arc welding shall be stored in the original container at room temperature and kept free of moisture, oil, dirt or other contaminants.
- (iii) Flux used for submerged arc welding shall be dry and free of contamination from dirt, mill scale, oil, or other foreign material. Fused flux shall not be used on the Work.
- (iv) Gas for gas metal arc welding shall be stored in marked steel bottles and shall not be subjected to temperatures in excess of 50°C nor temperatures of less than 0°C.

(c) Testing

- (i) In addition to the Contractor's own quality control testing, all materials, welding procedures, Shop Drawings, and steelwork fabrication will be inspected by the Contract Administrator to ascertain compliance with the Specifications and Drawings.
- (ii) A testing agency will work with the Contract Administrator to carry out inspection and testing. The Contractor shall cooperate fully with the testing firm.
- (iii) All welds will be visually inspected.
- (iv) The inspector shall have access to all of the fabricator's normal quality control records for this Contract specified herein.
- (v) Weld inspection will be carried out in accordance with the requirements of CSA Standard W59-03.
- (vi) Welds that are found to be inadequate and unsatisfactory shall be repaired in accordance with CSA Standard W59-03, retested and paid for by the Contractor.
- (vii) No repair shall be made until agreed to by the Contract Administrator.

E13.5.8 Unacceptable Work

- (a) Any Work found to be unacceptable shall be corrected in accordance with CSA Standard W59-03, Clause 5.10.
- (b) No repair shall be made until agreed to by the Contract Administrator.

E13.5.9 Measurement and Payment

- (a) The supply and erection of all structural steel, including all incidental structural steel elements, components and fasteners, will not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Structural Steel". The payment will be considered full payment for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E14. STRUCTURAL CONCRETE

E14.1 Description

- (a) The Work covered under this item shall include all operations relating to the placement of structural concrete.
- (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.

E14.2 Materials

E14.2.1 General

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

E14.2.2 Handling and Storage of Materials

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

E14.2.3 Testing and Approval

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to The City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least five (5) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E14.2.4 Bonding Agents

- (a) Latex Bonding Agent
 - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as approved by the Contract Administrator in accordance with B6.
- (b) Bonding Grout
 - (i) Grout for bonding new concrete to existing concrete, if used, may consist of the following constituents by weight:
 - 1 part water;
 - 1 part latex bonding agent; and
 - 1 ½ parts Type GUSF Portland Cement.
 - (ii) The consistency of the bonding grout shall be such that it can be brushed on existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E14.2.5 Curing Compound

- (a) If permitted for use, curing compound shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309 and the proposed standard ASTM P198. Rate of application shall be 1.5 times the rate required to meet the requirements of ASTM P198 for the texture of concrete to which the curing compound is being applied.
- (b) Curing compounds shall be resin-based and white-pigmented.

E14.2.6 Patching Mortar

- (a) The 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.

E14.2.7 Non-Shrink Cementitious Grout

- (a) Where non-shrink cementitious grout is used, it shall be Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, Meadows CG-86, or equal as accepted by the Contract Administrator. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E14.2.8 Formwork

- (a) Formwork materials shall conform to CSA Standard CAN/CSA-A23.1, and American Concrete Publication SP:4, "Formwork for Concrete."
- (b) No "stay-in-place" formwork or falsework is permitted with the exception of the metal deck under the curb and gutter.
- (c) 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.
- (d) 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".
- (e) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (f) No formwork accessories will be allowed to be left in place within 60 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.
- (g) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (h) 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 will be subjected.
- (i) 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.
- (j) All forms are incidental to these Works and must be removed by the Contractor once adequate strength and curing of the concrete has been achieved.

E14.2.9 Formliner

- (a) Formliner shall be Hydroform, Texel Drainform or equal as approved in accordance with B6.

E14.2.10 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel.
- (c) If requested by the Contract Administrator, the qualifications of the Contractor, and the mill certificates shall be submitted to the Contract Administrator for his review.
- (d) Reinforcing steel shall be fabricated to the lengths and shapes as shown on the Drawings. All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile

properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18-M92.

E14.2.11 Galvanized Reinforcing Steel

- (a) The reinforcing steel for the abutment back walls, pier columns, diaphragm at pier, deck and approach slabs, and all traffic barriers shall be galvanized reinforcing steel and shall conform to the requirements of CAN/CSA G30.18 M grade 400W and ASTM A767M-05.
- (b) Shop Applied
 - (i) The galvanizing shall be shop applied and strictly in accordance with ASTM A767M-05 to a retention equal to a Class II level (610 gm/rn²), except as otherwise specified herein.
 - (ii) Pre-clean reinforcing steel using acceptable methods to produce an acceptable surface for quality hot-dip galvanizing.
 - (iii) Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
 - (iv) The surface finish shall be continuous, adherent, as smooth and evenly distributed as possible, and free from any defect detrimental to the stated end use of the coated article.
 - (v) Coating adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
 - (vi) Sheared ends of bars shall be coated with a zinc-rich formulation before rusting occurs and before shipment to the job site.

E14.2.12 Galvanizing Touch-Up and Field-Applied Galvanizing

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

E14.2.13 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, if required, shall be cementitious material. No plastic, PVC, or galvanized bar chairs will be used.
- (c) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the concrete pier repairs.

E14.2.14 Concrete

- (a) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1-09:
 - (i) Class of Exposure: C-1
 - (ii) Compressive Strength @ 28 days = 35 MPa
 - (iii) Water / Cementing Materials Ratio = 0.4
 - (iv) Air Content: Category 1 per Table 4 of CSA A23.1-09.
 - (v) Special Requirement: Synthetic Fibres
- (b) Mix design for ready-mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.

- (c) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of ready mix concrete.
- (d) 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.
- (e) Concrete Materials susceptible to frost damage shall be protected from freezing.

E14.2.15 Aggregates

- (a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with CSA A23.1.
- (b) Coarse Aggregate
 - (i) The maximum nominal size of coarse aggregate may be 10 to 14 mm to suit the Contractor's mix design. Gradation shall be in accordance with CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in CSA A23.1, Table 12, "Concrete exposed to freezing and thawing.
 - (ii) Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; and shall have an absorption not exceeding 2.25%.
 - (iii) The aggregate retained on the 5mm 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.
 - (iv) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
 - (v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.
- (c) Fine Aggregate
 - (i) Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, Gradation FA1.
 - (ii) Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.
 - (iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

E14.2.16 Cementing Materials

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

materials that have been stored for a length of time resulting in the hardening or formation of lumps shall not be used in the Work.

E14.2.17 Admixtures

- (a) Air entraining admixtures shall conform to the requirements of ASTM C260.
- (b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.
- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators, and air-reducing agents will not be permitted, unless otherwise approved by the Contract Administrator.
- (d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.

E14.2.18 Water

- (a) Water to be used for mixing and curing concrete or grout and saturating substrate shall conform to the requirements of CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances.

E14.2.19 Synthetic Fibres

- (a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polyolefin as accepted by the Engineer. 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., except the post cracking residual strength index (Ri) shall be determined in accordance with ASTM C1609.

E14.2.20 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.

E14.2.21 Galvanized Metal Deck Form

- (a) Stay-in-place metal deck for the bridge deck slab shall be a minimum 0.76 mm HB 938 INV floor deck conforming to ASTM A446 latest edition Grade A steel with hot-dip galvanized coating in accordance with CSSBI Z275, as supplied by VicWest Steel Incorporated or approved equal. The metal deck for the sidewalk shall be secured with Hilti DX650 direct fastening system ENP-19L15 or equal, as approved by the Contract Administrator.
- (b) The concrete gutter shall be secured to the existing timber deck with lag screws conforming to ASME B18.2.1, galvanized.
- (c) The supply and installation of galvanized metal deck form and hardware will be considered incidental to the construction of the bridge deck slab and no separate measurement or payment will be made.

E14.2.22 Anchor units for Aluminium Pedestrian Handrail

- (a) Anchor units for the Aluminium Pedestrian handrail shall be Acrow-Richmond Type DGRS-1.

E14.2.23 Miscellaneous Materials

- (a) The Contractor shall supply all materials, as approved by the Contract Administrator, to ensure the satisfactory completion of the concrete works.

E14.3 Equipment

E14.3.1 General

- (a) All equipment shall be of a type accepted by the Contract Administrator. The equipment shall be in good working order, kept free from hardened concrete or foreign materials, and shall be cleaned at frequent intervals.
- (b) The Contractor shall have sufficient standby equipment available on short notice at all times.

E14.3.2 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.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

E14.3.3 Miscellaneous Equipment

- (a) The Contractor shall provide all miscellaneous equipment as required to properly and thoroughly execute and complete all operations related to the supply and placement of structural concrete.

E14.4 Construction Methods

E14.5 Scope of Work

- (a) It is intended that this specification covers the following structural concrete including all components and related fasteners:
 - (i) North Approach Curb
 - (ii) Main Truss Spans Curb and Gutter
 - (iii) South Approach Transition Slab and Curb

E14.5.1 Scaffolding

- (a) All scaffolding shall meet current Manitoba Workplace Health & Safety requirements.
- (b) All attachments to the pier shaft and related scaffolding shall be designed by a professional engineer registered in the Province of Manitoba. Sealed Drawings shall be submitted to the Contract Administrator a minimum of three (3) business days prior to the start of installation. Supply of sealed drawings shall be considered incidental to the Mobilization and Demobilization and no additional payment will be made.
- (c) Any anchorages remaining in the existing concrete shall be non-rusting and shall be a minimum of 50 mm from the final concrete surface.

E14.5.2 Surface Preparation

- (a) All resulting concrete surfaces and reinforcing steel shall be thoroughly cleaned by gritblasting. All gritblast material shall be blown out of the repair area, cleaned up, and removed off and away from the Site. The Contractor shall erect protection as necessary to protect passing pedestrians, cyclists, and river traffic.

E14.5.3 Anchor Units for Aluminum Pedestrian Handrail

- (a) All anchor units shall be installed as shown 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 pedestrian handrail posts as described in E17, "Aluminum Pedestrian Handrail Posts".

E14.5.4 Reinforcing Steel

- (a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.
- (b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.
- (c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.
- (d) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.
- (e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator. A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.
- (f) The reinforcing bars shall be firmly tied to the dowels.
- (g) Supply and installation of reinforcing steel shall be considered incidental to the structural concrete repair, and no additional payment will be made.

E14.5.5 Preparation of Galvanized Reinforcing Steel

- (a) The Fabricator shall consult with the Engineer and hot-dip Galvanizer regarding potential problems or potential handling problems during the galvanizing process which may require modification of design prior to proceeding with fabrication.
- (b) Remove all welding slag, splatter, antisplatter compounds, and burrs prior to delivery for galvanizing.
- (c) Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint, and other deleterious material prior to fabrication.
- (d) Remove by blast cleaning or other methods surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation.
- (e) Hooks or bends should be smooth and not sharp. When bars are bent cold prior to galvanizing, they shall be fabricated to a bend diameter equal to or greater than indicated in the following table:

TABLE 15.3.2 MINIMUM FINISHED BEND DIAMETERS	
Bar No.	Bend Diameters (mm)
10M	60
15M	90
20M	100
25M	150
35M	200
30M	250

- (f) The temperature of the reinforcing steel shall be at least 5°C before and during the bending process.

E14.5.6 Form Work and Shoring

- (a) Formwork shall be designed, erected, braced, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete.
- (b) As a maximum, the following spacing shall apply, for studding and whaling:
 - (i) 20 mm plywood: studding - 450 mm centre to centre
 - (ii) walers - 760 mm centre to centre
- (c) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against adsorption of moisture from the concrete by a field-applied form coating or a factory-applied liner.
- (d) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type. The portion remaining within the concrete shall leave no metal within 60 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 25 mm in diameter.
- (e) All exposed edges shall be chamfered 25 mm unless otherwise noted on the Drawings.
- (f) 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 structural drawings without the prior approval of the Contract Administrator.
- (g) 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.
- (h) Formwork shall have sufficient strengths and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
- (i) 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.
- (j) 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.
- (k) Formwork shall be cambered, where necessary to maintain the specified tolerances, to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

- (l) Forms shall be sufficiently tight to prevent leakage of grout or cement paste.
- (m) Form panels shall be constructed so that the contact edges are kept flush and aligned.
- (n) 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, free of extra charge, and the entire Site left in a neat and clean condition.
- (o) It shall be permissible to use the forms over again where possible, 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.

E14.5.7 Permeable Formwork Liner

- (a) Form liners shall be used on all exposed formed surfaces, except soffit surfaces.
- (b) The supply and use of the plain form liner finish shall be considered incidental to the Works of this Specification and no additional payment will be made.
- (c) The form liner shall be used for only one (1) application.

E14.5.8 Bonding New Concrete to Existing Concrete

- (a) 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. The Contract Administrator will check all repaired areas for bond using a hammer "sounding" methods after form removal. Place mortar or concrete by trowelling, pumping, spraying, or into forms ensuring that all entrapped air is removed.
- (b) Should a bonding group be used, it shall be applied immediately before concrete placement. It shall be thoroughly brushed onto the existing hardened concrete surface in a thin and even coating that will not puddle.

E14.5.9 Placing Structural Concrete

- (a) 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. Pumping of concrete will be allowed for all substructure concrete. All equipment and processes are subject to acceptance by the Contract Administrator.
- (b) 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.
- (c) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (d) 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.
- (e) Form liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (f) 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.
- (g) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (h) 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.

- (i) All non-self consolidating 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.
- (j) All self-consolidating concrete during and after depositing, shall be consolidated by thoroughly tapping the form work with hammers or mechanical vibrators so that the concrete is completely 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.
- (k) Vibrators, if required, 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. Spare vibrators in good working condition shall be kept on the job site during all placing operations.
- (l) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces.
- (m) Tops of piers are to be screeded with straight edges and floated with wooden floats after coarse aggregates have been forced down below the surface.

E14.5.10 Finishing of Concrete Surfaces

- (a) Exposed Formed Surfaces
 - (i) Form liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces.
 - (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.
 - (iii) All surfaces to receive a form liner finish shall be formed using Form Liner.
 - (iv) The surfaces shall be patched as specified under Clause E14.5.13 of this Specification. The surface shall be rubbed with a carborundum brick or other abrasive, to achieve a smooth-rubbed finish.
 - (v) The smooth-rubbed finish shall be produced on the newly hardened concrete surface no later than twenty-four (24) hours following form removal. Surfaces shall be thoroughly wetted and rubbed until uniform colour and texture are produced. No finishing mortar shall be used other than that produced from the concrete by the rubbing process.
 - (vi) The top surface of the transition slabs shall be given a broom finish. Upon completion of finishing operations, and when excessive moisture has evaporated, the plastic surface of the concrete shall be given a textured finish by means of broom finishing with a steel or fibre broom of a type accepted by the Contract Administrator at right angles to the direction of traffic. Surface depressions introduced by the broom strands in the brooming operations shall not be more than 3 mm deep.

E14.5.11 General Curing

- (a) The use of curing compound will not be required.
- (b) Unformed concrete surfaces shall be covered and kept moist by means of wet polyester blankets for seven (7) consecutive days immediately following finishing operations or otherwise approved by the Contract Administrator and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.
- (c) If permitted for use, curing compounds shall be applied at the rate of not less than 4 m²/L. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

- (d) 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.
- (e) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in any one hour period or 20° in any twenty-four hour period.
- (f) Formed surfaces shall receive, immediately after stripping and patching, the same application of curing compound as finished surfaces.
- (g) 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 polyester curing blanket and 6 mil polyethylene.
- (h) 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.

E14.5.12 Form Removal

- (a) All forms shall remain in place for a minimum of seven (7) days. The Contract Administrator must be notified at least 24 hours prior to any form removal. The Contractor must receive approval from the Contract Administrator prior to beginning Work.
- (b) Field-cured test specimens, representative of the in-place concrete being stripped, may be tested to verify the concrete strength.

E14.5.13 Patching of Formed Surfaces

- (a) Immediately after forms have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair or 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 sixty (60) mm from the surface before patching.
- (c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be thoroughly 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 adjacent 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.
- (d) All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by approved means to the Contract Administrator's satisfaction. Cement washes of any kind shall not be used.
- (e) Concrete shall be cast against forms that will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects that will impair the texture of concrete surfaces shall not be used. All fins on the concrete surfaces shall be removed.

E14.5.14 Cold Weather Concreting

- (a) The requirements of this section 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.
- (b) The Contract Administrator will advise the Contractor, in writing, as to the degree of heating of water and aggregates.
- (c) Supplementary equipment, as required below, shall be at the job site if concrete is likely to be placed in cold weather.
- (d) Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.
- (e) The temperature of the concrete shall be maintained at not less than 10°C for seven days or 15°C for five days or 20°C for three days after placing. The concrete shall be kept above freezing temperature for at least a period of seven days. In no case shall the heating be removed until the concrete has reached a minimum compressive strength, which will be specified by the Contract Administrator for Work under construction, and as determined from compressive strength tests for specimens secured under the same conditions as the concrete works in question.
- (f) Aggregates shall be heated to a temperature of not less than 20°C and not more than 55°C. Water shall be heated to a temperature between 20°C and 55°C. The temperature of the concrete at the time of placement shall be within the range specified in CSA Standard CAN/CSA-A23.1 for the thickness of the section being placed.
- (g) When the mean daily temperature may fall below 5°C, a complete hoarding of the Work, together with supplementary heat, shall be provided.
- (h) When the ambient temperature is below -15°C, the hoarding shall be constructed so as to allow the concrete to be placed without the hoarding having to be opened. If the mixing is done outside of the hoarding, the concrete shall be placed by means of hoppers installed through the hoarding. The hoppers are to be plugged when not in use.
- (i) When the ambient temperature is equal to or above -15°C, the Contractor will be permitted to open small portions of the hoarding for a limited time to facilitate the placing of the concrete.
- (j) Before depositing any of the concrete, the Contractor shall show that enough heating equipment is available to keep the air temperature surrounding the forms within the specified range. This shall be accomplished by bringing the temperature inside of the hoarding to the specified 20°C, at least 12 hours prior to the start of the concrete placing.
- (k) The Contractor shall supply all required heating apparatus and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided. The relative humidity within the heated enclosure shall be maintained at a minimum of 40 percent during concrete placing and finishing operations. Surface moisture evaporation rates shall not exceed the limits specified in E4.4.14(b). Following finishing operations, exposed concrete surfaces shall be protected from excessive drying by applying curing compound, covering the surfaces with polyethylene, or providing water curing.
- (l) Sufficient standby heating equipment must be available to allow for any sudden drop in outside temperatures and any breakdowns that may occur in the equipment.
- (m) Combustion-type heaters may be used if their exhaust gases are vented outside the enclosures and not allowed to come into contact with concrete surfaces. Fire extinguishers must be readily at hand wherever combustion-type heaters are used.
- (n) The Contractor shall keep a curing record of each concrete pour. The curing record shall include: date and location of the pour, mean daily temperature, hoarding relative humidity, temperatures above and below the concrete surface at several points, and notes regarding the type of heating, enclosure, unusual weather conditions, etc. This

record shall be available for inspection by the Contract Administrator at the end of the concrete operations.

E14.5.15 Hot Weather Concreting

(a) General

- (i) The requirements of this section shall be applied during hot weather; i.e. air temperatures above 25°C during placing.
- (ii) Concrete shall be placed at as low a temperature as possible, preferably below 15°C, but not above 22°C. Aggregate stockpiles may be cooled by watersprays and sunshades.
- (iii) Ice may be substituted for a portion of the mixing water, providing 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 watersprays.
- (v) Sunshades 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 approval 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 then appear in the Mix Design Statement submitted to the Contract Administrator.
- (viii) Curing shall follow immediately after the finishing operations.

(b) Hot Weather Curing

When the air temperature is at or above 25°C, curing shall be accomplished by water spray or by using saturated absorptive fabric, in order to achieve cooling by evaporation. 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 at or above 25°C, or when there is a probability of its rising to 25°C during the placing period, facilities shall be provided for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, as defined in E4.4.14(b), the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by fogging and evaporation.

(d) Concrete Temperature

- (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than that shown below for the indicated size of the concrete section.

Thickness of Section (m)	Temperatures, °C	
	Minimum	Maximum
Less than 0.3	10	35
0.3 to 1.0	10	30
1.0 to 2.0	5	25

E14.5.16 Cleanup

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

E14.6 Quality Control

E14.6.1 Inspection

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

E14.6.2 Access

- (a) The Contract Administrator shall be afforded full access for the inspection and control 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.

E14.6.3 Materials

- (a) All materials supplied under this Specification shall be subject to testing and acceptance by the Contract Administrator.

E14.6.4 Concrete Quality

- (a) Quality control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for quality control tests and provide such assistance and use of tools and construction equipment as is required.
- (c) The frequency and number of concrete quality control tests shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1-00.
- (d) An outline of the quality tests is as follows:
- (e) Slump tests shall be made in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-5C, "Slump of Concrete". If the measured slump falls outside the limits specified in the submitted and approved mix design a second test shall be made.
- (f) In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
- (g) Air content determinations shall be made in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits specified in Clause E14.2.14, 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.
- (h) The air-void system shall be proven satisfactory by data from tests performed in accordance with CSA Test Method CSA A23.2-00-17 C. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
- (i) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-1C, "Sampling Plastic Concrete".

- (j) Test specimens shall be made and cured in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (k) 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 CAN/CSA-A23.2-00-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (l) 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 Clause E14.2.14 and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens will be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of a single field-cured test specimen shall be determined in accordance with CSA Standard Test Method CAN/CSA-A23.2-00-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E14.7 Measurement and Payment

E14.7.1 Structural Concrete

- (a) Structural concrete shall be measured on a lump sum basis for each type of structural concrete as accepted by the Contract Administrator and no measurement will be made for this Work. All accessories like inserts are incidental to the supply and placement and no payment will be made for this Work.

E14.8 Basis of Payment

E14.8.1 Structural Concrete

- (a) The supply and placement of structural concrete will be paid for at the contract lump sum price for structural concrete for the "Items of Work" listed here below, as specified herein, which price shall be payment in full for supplying all operations herein described and all other items incidental to the work included in this specification.
- (b) Items of Work:
 - (i) Supply and Placement of Structural Concrete
 - North Approach Curb
 - Main Truss Spans Curb and Gutter
 - South Approach, Transition Slab and Curb

E14.8.2 Anchor Units for Pedestrian Handrail

- (a) Supplying and installing anchor units shall not be measured. This Item of Work shall be paid for at the contract lump sum price for "Supply and Install Anchor Units for Aluminium Pedestrian Handrail".

E15. NAIL LAMINATED DECK

E15.1 Description

- (a) This specification will cover all operations relating to the replacement of the bridge deck. The Work includes the following:
 - (i) Removal of the existing rotted portions of deck, as shown on drawings and as directed by the Contract Administrator.

- (ii) Filling abandoned bolt holes in the existing stringers with epoxy adhesive.
 - (iii) Supplying and installation of all treated dimension lumber and hardware to replace sections of rotted nail laminated deck as shown on the drawings.
 - (iv) Disposing of non-reusable materials and debris.
- (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.

E15.2 Materials

E15.2.1 General

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

E15.2.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E15.2.3 Testing and Approval

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

E15.2.4 Dimension Lumber

- (a) Dimension Lumber: Grade No.1 Structural Douglas-Fir or Spruce-Pine-Fir, treated with Chromate Copper Arsenate (CCA), Alkaline Copper Quaternary (ACQ) or equal in accordance with B6, conforming to the requirements of CSA Standard 086-1 (1994), National Building Code of Canada (1995) and to the details as shown on the Drawings.

E15.2.5 Wood Filler

- (a) Wood Filler: Epoxy adhesive gel for filling wood cavities and abandoned bolt holes shall be Rotafix Structural Adhesive manufactured by Rotafix Ltd. or equal in accordance with B6.

E15.2.6 Plywood Shims

- (a) Plywood Shims: All plywood shims shall be treated by immersing shim in timber preservative bath for no less than 24 hours. Pre-treated plywood will also be permitted.

E15.2.7 Field Preservative

- (a) Field preservative: Copper Naphthenate, IPBC, CCA chemical based system or equal in accordance with B6.

E15.2.8 Fastenings and Hardware

- (a) Fastenings and hardware: to the requirements of CAN/CSA-S6-00. All fastenings and hardware including nails, bolts, nuts, washers and screws shall be hot-dip galvanized in accordance with CSA G164 with minimum retention of 610 g/m².
- (b) Lag screws: per ASME B18.2.1, galvanized

- E15.2.9 Miscellaneous material
- (a) Miscellaneous material incidental to this work shall be approved by the Contract Administrator.
- E15.2.10 Equipment
- (a) All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.
- E15.3 Construction Methods
- E15.3.1 Deck Removal
- (a) Bolts, screws, pins and nails shall be carefully removed in such a manner as to avoid splitting and breaking of the timbers.
 - (b) Remove nails and bolts from each deck member, disconnecting it from timber blocking and stringers.
 - (c) Detach deck member from the stringers.
 - (d) Dismantle and remove the nail laminated deck in groups of six existing timbers and replace with seven new timbers, or as required to reinstall whole timbers.
- E15.3.2 Epoxy filling of abandoned bolt holes
- (a) All bolt holes previously used to connect the stringers to the deck planks will be abandoned. Fill these abandoned bolt holes with epoxy resin, following the manufacturer's guidelines.
 - (b) In lieu of filling each bolt hole entirely with epoxy adhesive, the Contractor may elect to insert a glass fibre rod and bond it to the hole using the epoxy adhesive. For this option, submit the rod property information to the Contract Administrator for review and approval prior to proceeding.
- E15.3.3 Deck Replacement
- (a) Install dimension lumber to form a nail-laminated deck for the bridge.
 - (b) For nailing each laminate to its adjacent one, use the nailing pattern shown on the drawings.
 - (c) Connect the bridge deck to the stringers using nails as shown on the drawings.
 - (d) If, during the attaching of the deck (to the stringers or tension ties), it is found that some areas of the deck do not bear fully on the structural members, these areas shall be shimmed using plywood shims as required, to obtain full bearing of the deck on the members.
- E15.3.4 Disposal of Materials
- (a) All structural removal materials not reused for the rehabilitation shall become the property of the Contractor to be removed from site.
 - (b) In no case shall disposable material be dumped into the channel of any water course.
- E15.3.5 Measurement and Payment
- (a) Nail laminated deck Works shall not be measured. This "Item of Work" will be paid for per square metre for "Nail Laminated Deck," which price will be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E16. BRIDGE DECK DRAINS

- E16.1 Description
- (a) This Specification shall cover supply, fabrication, transportation, handling and installation of bridge deck drains.

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

E16.2 Materials

E16.2.1 General

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

E16.2.2 Hot-Dip Galvanizing

- (a) All items supplied under this Specification shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a retention of 600 gm/m².

E16.2.3 Deck Drains

- (a) Each deck drain assembly including the boxes, gratings and drain pipes shall be fabricated from steel conforming to the requirements of CSA Standard CAN/CSA-G40.21-M98 Grade 300W.

E16.2.4 Galvanizing Touch-up

- (a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-01 for "Repair of Damaged Hot Dip Galvanizing Coatings". Approved products are "Galvalloy" as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and "Welco Gal-Viz Galvanizing Alloy", as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 150 McPhillips Street, Winnipeg, Manitoba.
- (b) Overhead field-applied galvanizing by zinc metallizing may be done by zinc metallizing with materials as specified for Galvanizing coating (zinc metallizing) in Specification E18 "Surface Preparation and Coating of Structural Steel".

E16.2.5 Welding Consumables

- (a) Welding consumables for all processes shall be certified by the manufacturer as complying with the requirements of CSA Standard W59-M1989 and the following specifications:
- (i) Manual, shielded metal arc-welding (SMAW):
All electrodes for manual, shielded metal arc-welding shall conform to CSA W48.1-M1991, CSA W48.3-93 classification E480XX or imperial equivalent.
- (ii) Gas metal arc-welding (GMAW):
All electrodes used in the gas metal arc-welding process shall be composite electrodes conforming to CSA W48.4-95 classification ER490S-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):
All electrodes and fluxes used for 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 approval at least fourteen (14) 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.

E16.3 Equipment

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

E16.4 Construction Methods

E16.4.1 Scope of Work

- (a) It is intended that this Specification cover all items necessary for the complete supply and installation of the bridge deck drains, including all components and related fasteners, as shown on the Drawings.

E16.4.2 Fabrication

E16.4.2.1 General

- (a) Except as otherwise specified herein, steel work shall be fabricated in accordance with the latest A.W.S. Specification D1.1 and subsequent revisions. Fabrication shall be in accordance with the latest AASHTO specification and all subsequent revisions.
- (b) At least fourteen (14) days prior to the scheduled commencement of any fabrication, the operators' qualifications, the shop drawings, welding procedures, mill certificates and welding consumable certificates shall be submitted to the Contractor Administrator for his review. The shop drawings shall consist of three (3) sets of prints and one (1) reproducible sepia set.
- (c) No fabrication or welding of steelwork shall commence until permission to do so has been received from the Contract Administrator.
- (d) The repair of any members damaged during fabrication shall be approved by the Contract Administrator.

E16.4.2.2 Preparation of Material

- (a) Straightening Material
 - (i) Prior to being used in fabrication, all structural steel shall be straight and free from kinks or bends. If straightening is necessary, it shall be done by methods that will not injure the metal. The steel shall not be heated unless permission is given by the Contract Administrator. Sharp kinks and bends will be cause for rejection of the steel.
- (b) Bending Material
 - (i) Steel items to be bent shall be bent by methods that will not injure the metal. The steel shall not be heated unless permission is given by the Contract Administrator. Any damage to the galvanizing surface shall be repaired in accordance with Clause E12.4.3.2 of this Specification.
- (c) Edge Preparation for Welding
 - (i) The edges of plates or sections which are to be welded together shall be prepared by sawing, shearing, flame-cutting, machining, chipping or arc air gouging to the details shown on the shop drawings. Surfaces and edges to be welded shall be smooth, uniform and free from fins, tears, cracks, and other defects which would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free from loose scale, slag, rust, grease, moisture or other material that will prevent proper welding. Mill scale that withstands vigorous wire brushing, a light film of drying oil or a thin rust

inhibitive coating may remain. Surfaces within 50 mm of any weld location shall be free from any paint or other material that would prevent proper welding or produce objectionable fumes while welding.

- (ii) Edges of material thicker than specified in the following list shall be trimmed if and as required to produce a satisfactory welding edge wherever a weld along the edge is to carry calculated stress:

Sheared edges of material thicker than	12 mm
Rolled edges of plates (other than Universal Mill Plates) thicker than	9 mm
Toes of angles or rolled shapes (other than wide flange sections) thicker than	16 mm
Universal Mill Plates or edges of flanges of wide section thicker than	25 mm

- (iii) Edges may be prepared by oxygen cutting, providing that a smooth and regular surface free from cracks and notches is secured, and providing that an accurate profile is secured by the use of a mechanical guide. Freehand cutting shall be done only where approved by the Contract Administrator.
- (iv) In all oxygen cutting, the cutting flame shall be so adjusted and manipulated as to avoid cutting beyond (inside) the prescribed lines. Roughness of cut surfaces shall not be greater than that defined by the United States Standards Institute surface roughness value of 1,000 (USAI B46.1, Surface Texture). Roughness exceeding this value shall be removed by machining or grinding.
- (v) Occasional gouges shall be tolerated only at the discretion of the Contract Administrator and shall be repaired in accordance with his instruction.

(d) Edge Preparation (Non-welded Edges)

- (i) Steel may be cut to size by sawing, shearing, flame-cutting or machining. All steel after cutting shall be marked by a method agreed to by the Contract Administrator so that its Specification may be immediately identified.
- (ii) Sheared edges of plates more than 16 mm in thickness shall be planed to a depth of 6 mm.
- (iii) Any flame cutting of steel shall be in accordance with Clause E12.4.2.2(c).
- (iv) Edges of flame cut flange plates shall be ground to a radius of 2 mm. Re-entrant cuts shall be filleted to a radius of not less than 19 mm.

E16.4.2.3 Butt Joints

- (a) Minimize the number of butt joints by maximizing the length of plates. Details of all butt joints shall be submitted to the Contract Administrator for his review. The fabricator may submit an alternative butt joint design provided that such design has been pre-qualified by A.W.S..

E16.4.2.4 Assembly and Welding Sequences

- (a) If requested by the Contract Administrator, the Fabricator shall supply full details of the proposed assembly and welding sequence of any particular weldment.

E16.4.2.5 Marking

- (a) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system approved by the Contract Administrator.

E16.4.2.6 Assembly

- (a) The shop assembly of the various components of the weldments shall be executed in accordance with A.W.S. D1.1 Subsections 3.3 and 3.4.

E16.4.2.7 Preheat and Interpass Temperatures.

- (a) No welding shall be done when the temperatures of the base metal is lower than - 20°C. At temperatures below 0°C, the steel shall be preheated to a temperature of at least 10°C in excess of that stated in Table 1.
- (b) Preheat shall be applied to all steel to be welded so that the steel within 75 mm of the weld is heated to the temperature shown in Table 1.
- (c) Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.
- (d) For all welding processes, preheat and interpass temperatures shall be maintained during welding at temperatures not less than stated in Table 1.

Table 1	
Minimum Preheat and Interpass Temperatures	
Thickness of Thickest Part at Point of Welding	C.S.A. Standard CAN/C.S.A. Grade 300W G40.21-M98
Less than 19 mm	21°C
19 mm to 38 mm	66°C

- (e) Preheat temperatures above the minimum shown in Table 1 may be required for highly restrained joints if designated by the Contract Administrator.
- (f) Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.
- (g) Preheat requirements for tack welds shall be as in the above table except that where single pass tack welds are used and are to be incorporated and consumed in a weld made by the submerged arc and the gas metal arc processes, preheat is unnecessary.

E16.4.2.8 Welding

- (a) Welding shall be done by the manual, shielded metal arc, gas shielded metal arc or submerged arc processes in accordance with the approved procedures and A.W.S. D1.1 Section 4, Technique.
- (b) All welding shall be done under cover and, in the case of gas metal arc-welding, shall be done in an area free from wind or draft.

E16.4.2.9 Hot-Dip Galvanizing

- (a) All items under this specification, except stainless steel fasteners, shall be hot-dip galvanized. Hot-dip galvanizing of complete items shall be done after fabrication in accordance with CSA Standard G164-M92 to a minimum net retention of 600 gm/m² unless noted otherwise. All metal surfaces to be galvanized shall be thoroughly cleaned of rust, rust scale, mill scale, dirt and other contaminants by commercial sand, grit or shot blasting and/or pickling prior to galvanizing. Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling.

E16.4.2.10 Handling and Storing Materials

- (a) Material to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. Long members shall be supported on skids placed near enough to prevent injury from deflection.

E16.4.2.11 Straightening Bent Material

- (a) The straightening of plates and angles or other shapes shall be done by methods that will not produce a fracture or other injury. The metal shall not be heated unless

permitted by the Contract Administrator, in which case the heating shall not be to a higher temperature than that producing a "dark cherry red" colour. After heating, the metal shall be cooled as slowly as possible.

- (b) Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture, and if necessary, replaced or repaired to the satisfaction of the Contract Administrator.

E16.4.3 Installation

E16.4.3.1 Installation of Deck Drains

- (a) The deck drains shall be installed at the locations and according to the details shown on the Drawings.
- (b) The drain pipes shall be installed so that the pipes are vertical or angled as shown on the Drawings.
- (c) The deck drain assemblies shall be set into the deck and held in place securely so that they will not move out of position during the placement of deck concrete.
- (d) Adjustments to adjacent reinforcement bars shall be made as required to provide for proper location and placement of the deck drains.

E16.4.3.2 Galvanizing Touch-up Procedure

- (a) Any areas of damaged galvanizing, and all field welds, are to receive field-applied galvanizing as specified herein.
- (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.

E16.5 Quality Control

E16.5.1 Inspection

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

E16.5.2 Access

- (a) The Contractor shall allow the Contract Administrator free access to all parts of the work at all times.

E16.5.3 Qualifications of Contractor

- (a) The Contractor shall produce evidence that his plant is recently fully approved by the C.W.B. to the requirements of CSA Standard W47.1-92, Division 2.1.

E16.5.4 Qualifications of Operators

- (a) The Contractor shall produce evidence that all welding operators to be employed on the work are currently qualified by the C.W.B. at the time of fabrication and in the processes in which they are to be employed on the work. Such qualification shall have been issued within two years of the commencement of fabrication.

- (b) The Contractor shall also produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six-month period previous to the award of this Contract.

E16.5.5 Welding Procedures

- (a) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and approval by the Contract Administrator.
- (b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the work is to be carried out.
- (c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding.
- (d) The use of gas welding will be limited to light structural elements.

E16.5.6 Quality and Details of Welds

- (a) The quality and details of welds shall be in accordance with A.W.S. D1.1, Subsection 9.25.
- (b) Welds shall have no cracks inadequate penetration or lack of fusion, and shall have no other defects exceeding the A.W.S. D1.1, Subsection 9.25. Fusion type defects referred to in Subsection 9.25 shall be interpreted as slag inclusions and similar generally elongated defects.

E16.5.7 Material Storage and Care

E14.5.7.1 Steel

- (a) Bridge deck drain items, either plain or fabricated, shall be stored above the ground upon platforms, skids or other supports. It shall be kept free from dirt and other foreign matter, and shall be protected, as far as practical, from corrosion. Long members shall be supported on skids placed near enough together to prevent injury from deflection.
- (b) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system approved by the Contract Administrator.

E14.5.7.2 Welding Consumables

- (a) All electrodes having low hydrogen coverings shall be dried for at least two (2) hours between 230°C and 260°C before they are used. Electrodes shall be stored immediately after drying in storage ovens held at a temperature of at least 120°C. Electrodes that are not used within four (4) hours after removal from a drying or storage oven shall be re-dried before use. Electrodes which have been wet shall not be used.
- (b) Electrode wire used in submerged arc-welding and gas metal arc-welding shall be stored in the original container at room temperature and kept free of moisture, oil, direct or other contaminants.
- (c) Flux used for submerged arc-welding shall be dry and free of contamination from dirt, mill scale, oil or other foreign material. Fused flux shall be used on the work.
- (d) Gas for gas metal arc-welding shall be stored in marked steel bottles and shall not be subjected to temperatures in excess of 50°C nor temperatures of less than 0°C.

E16.5.8 Testing

- (a) All materials, welding procedures, shop drawings and steelwork fabrication will be inspected by the Contract Administrator to ascertain compliance with the Specifications and Drawings.
- (b) All welds will be visually inspected.

- (c) The Inspector shall have access to all the Fabricator's normal quality control records for this Contract and not specified herein.
- (d) Weld inspection will be carried out in accordance with the requirements of A.W.S. D1.1.
- (e) Welds that are found by any of the inspection methods to be inadequate and unsatisfactory shall be repaired in accordance with A.W.S. D1.1 and then re-tested. The cost of the repairs, and of the tests that reveal inadequate and unsatisfactory welds shall be paid for by the Contractor. All other testing specified herein will be paid for by the Owner.
- (f) No repair shall be made until agreed to by the Contract Administrator.

E16.5.9 Unacceptable Work

- (a) Any work found to be unacceptable shall be immediately brought to the attention of the Contract Administrator and shall be corrected in accordance with A.W.S. D1.1, Subsection 3.7.
- (b) No repair shall be made until agreed to by the Contract Administrator.

E16.6 Measurement and Payment

- (a) The supply, fabrication, transportation, handling and installation of the deck drains will be paid for at the Contract Lump Sum Price for "Deck Drains", and no measurement will be made for this work. The payment will be considered full payment for supplying all materials and performing all operations herein described and all other items incidental to the Work.

E17. ALUMINUM PEDESTRIAN HANDRAIL

E17.1 Description

- (a) This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E17.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;
 - (ii) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;
 - (iii) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;
 - (iv) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;
 - (v) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;
 - (vi) CAN/CSA W59.2 – Welded Aluminum Construction; and
 - (vii) CAN/CSA S157 – Strength Design in Aluminum.

E17.3 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the

proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail. Fabrication shall take place as shown on the Drawings.

- (c) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications and mill certificates.
- (d) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the The City of Winnipeg Specifications proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
 - (i) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.
 - (ii) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.
 - (iii) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding

E17.4 Materials

E17.4.1 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E17.4.2 Material for the Aluminum Pedestrian Handrail

- (a) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6).
Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.
- (b) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

E17.4.3 Bituminous Paint

- (a) Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187.

E17.4.4 Handrail Anchorage System

- (a) The handrail anchorage system is specified and in accordance with Specification E14 "Structural Concrete".

E17.4.5 Aluminum Shims

- (a) Aluminum shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the Drawings.

E17.4.6 Aluminum Filler Alloys for Welded Construction

- (a) Aluminum filler alloys for welded construction shall be one of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654.

E17.4.7 Hinges

- (a) Hinges shall be stainless steel and manufactured by Angama, Type STBB 460, or equal as approved by the Contract Administrator.

E17.4.8 Equipment

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

E17.5 Construction Methods

E17.5.1 Layout

- (a) Before fabrication and/or installation of the aluminum pedestrian handrail, the Contractor shall satisfy himself of all required aluminum rail and enclosure section dimensions, by field measurements.

E17.5.2 Fabrication

(a) General

- (i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.
- (ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.
- (iii) The Fabricator shall fabricate the entire aluminum pedestrian handrail in sections, to permit the installation of the rail sections onto the concrete.
- (iv) The punching of identification marks on the members will not be allowed.
- (v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.
- (vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.
- (vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

(b) Sample Panel

- (i) The Contractor shall be required to supply one completely fabricated handrail sample panel, including at least two posts, to the Contract Administrator and receive acceptance of the sample panel from the Contract Administrator prior to proceeding with the fabrication of the remainder. The sample, once accepted, shall be identifiable for the duration of the Project, but may be incorporated into the rail system. It shall become the standard for acceptance of all aluminum pedestrian handrail panels.

(c) Cutting

- (i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

(d) Welding

- (i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.
- (ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.

- (iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:
 - (iv) Guided Bend Test: All bend tests should be fully guided through an angle of 180°. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.
 - (v) Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.
 - (vi) Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed 3% of the area under inspection.
- (e) Bolting
- (i) Bolt holes in 10 mm or thinner material may be drilled or punched to finished size. In material thicker than 10 mm, the holes shall be drilled to finished size or subpunched smaller than the normal diameter of the fastener and reamed to size.
 - (ii) The finished diameter of the holes shall be not more than 7 percent greater than the nominal diameter of the fastener, except:
 - (iii) Slotted holes for expansion purposes shall be provided as required on the Drawings
 - (iv) Holes for anchor bolts may be up to 50 percent greater than the nominal bolt diameter with a maximum of 13 mm greater than the nominal bolt diameter.
 - (v) Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.
 - (vi) In all bolts, the finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are tightened.

E17.5.3 Installation of Aluminum Pedestrian Handrail

- (a) The aluminum pedestrian handrail shall be brought on-site and accurately installed as shown on the Drawings.
- (b) The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.
- (c) The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted. The Contractor shall report to the Contract Administrator any corrective measures.
- (d) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be separated with a minimum of two (2) coats of bituminous paint. A minimum 3 mm aluminum shim shall be installed under each post.

E17.5.4 Quality Control

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

E17.5.5 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.

E17.5.6 Testing

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contractor as directed by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator.

E17.1 Measurement and Payment

- (a) Aluminium Pedestrian Handrail shall be paid for at the Contract Lump Sum Price which price shall be payment in full for supplying all equipments and performing all operations herein described and all other items incidental to the Work included in this Specification.

E18. EXPANSION JOINT SEALS

E18.1 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 Elm Park Pedestrian Bridge:
 - (i) Between transition slab and existing deck at the south approach; and
 - (ii) Between north approach and main truss spans.
- (b) 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.
- (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.

E18.2 Materials

E18.2.1 General

- (a) Preformed elastomeric joint seal (Compression Seal) EMSEAL BEJS or equivalent as approved by the Contract Administrator: to ASTM D2628 and ASTM D3542
- (b) Lubricant-adhesive for use with preformed elastomeric seal: to ASTM D4070
- (c) Expansion Joint Armour: Watson Bowman Type A or Type M or equivalent as approved by the Contract Administrator.
- (d) Shear Stud: to ASTM A108
- (e) Backing Rod: to ASTM D5249

- (f) Joint Sealant: Low modulus silicone rubber type with 1200% ultimate elongation

E18.3 Construction Methods

E18.3.1 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 for length of each joint.
- (e) Hot dip galvanize in accordance with CSA-G164 to retention of 600 grams per square meter.

E18.3.2 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.

E18.4 Measurement and Payment

- (a) Expansion joint seals at the locations listed in E20.1(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.

E19. CHAIN LINK FENCING

E19.1 Description

- (a) Install Chain Link Fencing to the limits shown on the drawings. Chain Link Fencing will be in accordance with CW3550-R2. Height to match existing.

E19.2 Measurement and Payment

- (a) Chain Link Fencing will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Chain Link Fencing", performed in accordance with this Specification and accepted by the Contract Administrator.

E20. ASPHALT RESURFACING WORKS

E20.1 Description

- (a) The Work covered under this item shall include all operations relating to asphalt resurfacing Works in accordance with this Specification and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E20.2 Materials

- (a) All materials shall be in accordance with Standard Construction Specification CW 3250-R6, CW 3410-R7, and CW 3450-R5.
- (b) Sub-base material shall be in accordance with Standard Construction Specification CW 3110-R4.

E20.3 Equipment

- (a) All equipment shall be in accordance with Standard Construction Specification, CW 3410-R7 and CW 3450-R5

E20.4 Construction Methods

- (a) All construction methods shall be in accordance with Standard Construction Specification CW 3250-R6, CW 3410-R7, and CW 3450-R5 as amended below.

E20.5 Asphalt Placement

- (a) Place asphalt to the grades shown on the drawings.

E20.6 Measurement and Payment

- (a) Construction of Asphaltic Concrete Overlay.
 - (i) Construction of asphaltic concrete overlay will be measured and paid for at the Contract Unit Price per tonne for the "Items of Work" listed 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.