Canada

Manitoba

Winnipeg

THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 257-2005

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

UMA Project No. 41 09 0265 376

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PART B - BIDDING PROCEDURES

B1. PROJECT TITLE

B1.1 REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 9, 2005.

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

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

B3. SITE INVESTIGATION AND EXISTING DRAWINGS

B3.1 Further to GC:3.1, the Contract Administrator or an authorized representative will be available at the Site from 9:00 a.m. to 11:00 a.m. on Monday, July 25, 2005 to provide Bidders access to the Site.

B3.2 The Bidder may view the Site, except for the top of piers, without making an appointment.

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

B3.4 Available existing drawings may be viewed at the office of the Contract Administrator. The accuracy of these drawings is not guaranteed and the Bidder must interpret based on site investigation.

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 Branch internet site at http://www.winnipeg.ca/matmgt.

B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda shortly before submitting his Bid.

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

B6. SUBSTITUTES

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

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

B6.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least 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 shall base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B15.

B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B7. BID SUBMISSION

B7.1 The Bid Submission consists of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

B7.2 All components of the Bid Submission shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely in ink, to constitute a responsive Bid.

B7.3 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B7.3.1 Samples or other components of the Bid Submission which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder’s Bid Submission.

B7.4 Bid Submissions submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B7.5 Bid Submissions shall be submitted to:

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

B8. BID

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B9. PRICES

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

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

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

B10. QUALIFICATION

B10.1 The Bidder shall:

(a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba;

(b) be responsible and not be suspended, debarred or in default of any obligation to the City;

(c) be financially capable of carrying out the terms of the Contract;

(d) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract;

(e) have successfully carried out Work, similar in nature, scope and value to the Work;

(f) employ only Subcontractors who:

(i) are responsible and not suspended, debarred or in default of any obligation to the City (a list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt); and

(ii) have successfully carried out Work similar in nature, scope and value to the portion of the Work proposed to be subcontracted to them, and are fully capable of performing the Work required to be done in accordance with the terms of the Contract;

(g) have a written workplace safety and health program in accordance with The Workplace Safety and Health Act (Manitoba);

(h) provide proof, if requested by the Contract Administrator, that his key supervisory and managerial personnel listed for the Work have successfully been gold seal certified by the Canadian Construction Association, or as otherwise accepted by the Contract Administrator.

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

(a) a valid COR certification number under the Certificate of Recognition (COR) Program - Option 1 administered by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or

(b) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association; or

(c) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.)

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

B10.4 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. BID SECURITY

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

(a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or

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

(c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least one hundred percent (100%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

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

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

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

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

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

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

B12.1.1 Bidders or their representatives may attend.

B12.1.2 Bid Submissions determined by the Manager of Materials, or his designate, to not include the bid security specified in B11 will not be read out.

B12.2 After the public opening, the names of the Bidders and their Total Bid Prices as read out (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

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

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

B13. IRREVOCABLE BID

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

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

B14. WITHDRAWAL OF BIDS

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

B14.1.1 Notwithstanding GC:23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

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

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

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

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

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

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

B15. EVALUATION OF BIDS

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

(a) compliance by the Bidder with the requirements of the Bid Opportunity (pass/fail);

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

(c) Total Bid Price or Evaluated Bid Price;

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

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

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

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

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

B15.5 The Contract may be awarded on the basis of:

(a) Alternative 1 – Option 1 for surface preparation and coating of structural steel.

(b) Alternative 2 – Option 2 for surface preparation and coating of structural steel.

as identified on Form B: Prices. Each alternative will be evaluated in accordance with the specified evaluation criteria. Only one (1) alternative will be selected and the award made on that basis.

B16. AWARD OF CONTRACT

B16.1 The City will give notice of the award of the Contract by way of a letter of intent, or will give notice that no award will be made.

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

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

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

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

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

(d) only one Bid is received; or

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

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

B17. FEDERAL/PROVINCIAL INFRASTRUCTURE PROGRAM

B17.1 Further to GC:6, the Contractor shall prepare and maintain proper and accurate accounts of records, including invoices, statements, receipts and vouchers, in accordance with generally accepted accounting principles for at least five (5) years from Total Performance. The Contractor agrees that representatives of the Province of Manitoba and the Government of Canada, their Management Committee and their authorized representatives, to the extent possible under the legislation applicable to Manitoba, will have free access to the Site and to any documentation, including accounts and records, relevant for the purpose of audit of the Work.

B17.2 GC 3.2 is hereby amended by deleting 3.2 (a) and substituting the following thereof:

(a) Does so in good faith and that to the best of his knowledge, no member of the House of Commons or the Senate of Canada will be admitted to any share or part of any contract made pursuant to this Contract, or any benefit arising from it and no member of Council or any officer or employee of the City has any pecuniary interest, direct or indirect, in the Contract.

PART C - GENERAL CONDITIONS

C1. GENERAL CONDITIONS

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

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D1.2 The General Conditions are amended by striking out “The City of Winnipeg Act” wherever it appears in the General Conditions and substituting “The City of Winnipeg Charter”.

D1.3 The General Conditions are amended by striking out “Tender Package” wherever it appears in the General Conditions and substituting “Bid Opportunity”.

D1.4 The General Conditions are amended by striking out “Tender Submission” wherever it appears in the General Conditions and substituting “Bid Submission”.

D1.5 The General Conditions are amended by deleting GC:6.16 and GC:6.17. The City of Winnipeg is now within the jurisdiction of the Manitoba Ombudsman pursuant to The Ombudsman Act.

D2. SCOPE OF WORK

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

(a) Bridge structural rehabilitation and modifications

(b) Approach roadways and sidewalk rehabilitation and modifications

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

(a) Bridge structural Works
  (i) Pier concrete removals and encasements
  (ii) Bridge deck and sidewalk removal and replacement
  (iii) Bridge abutments and approach slab rehabilitation
  (iv) Structural steel member replacement
  (v) Structural steel preparation and coating
  (vi) Expansion joint replacements
  (vii) Bridge bearing replacements
  (viii) Shoulder barrier railing
  (ix) Pedestrian handrailing
  (x) Electrical modifications

(b) Roadworks
  (i) Concrete pavement replacement
  (ii) Asphalt overlay
  (iii) Concrete curb replacement
  (iv) Aluminum traffic railing
  (v) Concrete sidewalk replacement
  (vi) Landscape restoration

D3. DEFINITIONS

D3.1 See Drawing 02 for definitions of abbreviations used on the Drawings.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is UMA Engineering Ltd., represented by:

Barry Biswanger, P.Eng.
Senior Engineer, Structures
1479 Buffalo Place, Winnipeg, Manitoba, R3T 1L7

Telephone No. (204) 284-0580
Facsimile No. (204) 475-3646

D4.2 At the pre-construction meeting, Barry Biswanger, P.Eng. 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 GC:23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

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 All notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

The City of Winnipeg
Chief Administrative Officer Secretariat
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9

Facsimile No.: (204) 949-1174

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
Corporate Services Department
Legal Services Division
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. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D8.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

D9. INSURANCE

D9.1 The Contractor shall provide and maintain the following insurance coverage at all times during the performance of the Work and throughout the warrant period except for all claims made policies, which shall be maintained for a minimum period of twenty-four (24) months after the date of Total Performance:

(a) Commercial General Liability insurance, in the minimum amount of ten million dollars ($10,000,000.00) inclusive. The said Commercial General Liability insurance shall include coverage for products and completed operations, blanket contractual liability, cross liability, non-owned automobile, and unlicensed motor vehicle liability. The said Commercial General Liability insurance shall include the City of Winnipeg, the Province of Manitoba, and Her Majesty the Queen in Right of Canada as represented by her ministers, officers, employees and agents, and the Contract Administrator as additional insureds.

(b) All Risk Course of Construction insurance in the amount of one hundred percent (100%) of the total Contract price written in the name of the Contractor and the City of Winnipeg and shall include the Province of Manitoba, and Her Majesty the Queen in Right of Canada as represented by her ministers, officers, employees and agents, and the Contract Administrator as additional insureds.

(c) If watercraft are used in connection with the Work, and where not otherwise covered by Contractor's commercial general liability policy, Watercraft Liability insurance for owned and non-owned watercraft and/or floating apparatus in the amount of at least two million dollars ($2,000,000.00) is required. The said Watercraft Liability insurance shall include cross liability and shall include the Province of Manitoba, and Her Majesty the Queen in Right of Canada as represented by her ministers, officers, employees and agents, and the Contract Administrator as additional insureds.

(d) 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).

D9.2 The Contractor shall carry deductibles of no more than $10,000.00

D9.3 Deductibles shall be borne by the Contractor.

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

D9.5 The Contractor shall provide the City Solicitor with evidence of insurance detailing all insurance requirements, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D9.6 GC:17 is hereby amended by adding the following:

(a) The Contractor agrees at all times to indemnify and save harmless Her Majesty in the Right of Canada and Her Majesty in the Right of Manitoba, its officers, servants, employees or agents, from and against all claims and demands, loss, costs, damages, actions, suits or other proceedings by whomsoever brought or prosecuted in any manner based upon, or occasioned by any injury to persons, damage to or loss or destruction of property, economic loss or infringement of rights caused by or arising directly or indirectly from:

(i) The performance of this Contract or the breach of any term or condition of this Contract by the Contractor, its officers, employees, agents and subcontractors; and

(ii) Any omission or other wilful or negligent act of the Contractor and its officers, employees, agents and subcontractors except to the extent to which such claims and demands, losses, costs, damages, actions, suit, or other proceedings relate to the act of negligence of an officer, employee or agents of Her Majesty in the Right of Canada or Her Majesty in the Right of the Province of Manitoba in the performance of his or her duties.

D10. PERFORMANCE SECURITY

D10.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

(a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of one hundred percent (100%) 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 one hundred percent (100%) 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 one hundred percent (100%) of the Contract Price.

D10.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D10.2 If the bid security provided in his Bid Submission was not a certified cheque or draft pursuant to B11.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D11. SUBCONTRACTOR LIST

D11.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D12. EQUIPMENT LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D13. DETAILED WORK SCHEDULE

D13.1 The Contractor shall provide the Contract Administrator with a detailed Work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

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

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

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

(c) a daily manpower schedule for the Work;

all acceptable to the Contract Administrator.

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

(a) Pier concrete removals

(b) Pier concrete placements

(c) Environmental protection installation and removal

(d) Pedestrian and Traffic Control installation and removal

(e) Span 1 structural removals

(f) Span 1 bearing replacement

(g) Span 1 structural steel

(h) Span 1 structural steel preparation and coating

(i) Span 1 deck slab

(j) Span 1 curbs and sidewalks

(k) Span 2 structural removals

(l) Span 2 bearing replacement

(m) Span 2 structural steel

(n) Span 2 structural steel preparation and coating

(o) Span 2 deck slab

(p) Span 2 curbs and sidewalks

(q) Span 3 structural removals

(r) Span 3 bearing replacement

(s) Span 3 structural steel

(t) Span 3 structural steel preparation and coating

(u) Span 3 deck slab

(v) Span 3 curbs and sidewalks

(w) Span 4 structural removals
(x) Span 4 bearing replacement
(y) Span 4 structural steel
(z) Span 4 structural steel preparation and coating
(aa) Span 4 deck slab
(bb) Span 4 curbs and sidewalks
(cc) Span 5 structural removals
(dd) Span 5 bearing replacement
(ee) Span 5 structural steel
(ff) Span 5 structural steel preparation and coating
(gg) Span 5 deck slab
(hh) Span 5 curbs and sidewalks
(ii) Expansion joint installation at west abutment
(jj) Expansion joint installation at Pier #2
(kk) Expansion joint installation at Pier #4
(ll) Expansion joint installation at Pier #5
(mm) Expansion joint installation at east abutment
(nn) West abutment concrete Works
(oo) East abutment concrete Works
(pp) Approach slab
(qq) Pedestrian handrail installation
(rr) Bridge shoulder barrier railing
(ss) Road Works west approach
(tt) Road Works east approach

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

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

SCHEDULE OF WORK

D14. COMMENCEMENT

D14.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

D14.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
(i) evidence that the Contractor is in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba;

(ii) evidence of the workers compensation coverage specified in GC:6.14;

(iii) the Safe Work Plan specified in D8;

(iv) evidence of the insurance specified in D9;

(v) the performance security specified in D10;

(vi) the Subcontractor list specified in D11;

(vii) the equipment list specified in D12;

(viii) the detailed Work schedule specified in D13; and

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

D14.3 The Contractor shall not commence the Work on the Site before October 3, 2005, and shall commence the Work on Site no later than January 3, 2006, as directed by the Contract Administrator and weather permitting.

D14.4 Vehicular traffic shall be maintained on the bridge and approach roadways until January 3, 2006 when the approach roadways and bridge shall be closed to all vehicular traffic in accordance with the Bid Documents. The only Work that may be carried out on site prior to January 3, 2006 is on the piers as listed below:

(a) Removals on the piers from 4.5 metres above the top of the existing encasements and below (except not within 300 mm of any existing tie straps).

(b) Removal of the nose plates all the way up.

(c) Installation of the new nose angles to 4.5 metres above the top of the existing encasements.

(d) Casting of the new concrete encasements to 3.5 metres above the existing encasements.

D14.5 The Contractor will be permitted to close one sidewalk to the public on the bridge to facilitate access for this Work prior to January 3, 2006 provided appropriate barricades, signage and Pedestrian and Traffic Protection/Accommodation is provided.

D15. SUBSTANTIAL PERFORMANCE

D15.1 The Contractor shall achieve Substantial Performance by October 16, 2006, including re-opening of the bridge to all traffic.

D15.2 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.

D15.3 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.

D16. TOTAL PERFORMANCE

D16.1 The Contractor shall achieve Total Performance by October 30, 2006. Further, the Contractor shall achieve Substantial Performance on Work on the Piers to 3.5 metres above the existing encasements by March 1, 2006.

D16.2 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.

D16.3 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.

D17. LIQUIDATED DAMAGES

D17.1 If the Contractor fails to achieve Total Performance in accordance with the Contract by the day fixed herein for Total Performance, the Contractor shall pay the City five thousand dollars ($5,000.00) per Calendar Day for each and every Calendar Day following the day fixed herein for Total Performance during which such failure continues.

D17.2 The amount specified for liquidated damages in D17.1 is based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Total Performance by the day fixed herein for same.

D17.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D18. SCHEDULED MAINTENANCE

D18.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Landscape Restoration as specified in E5.

D18.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D19. JOB MEETINGS

D19.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D19.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D20. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D20.1 Further to GC:6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D21. OFFICE FACILITIES

D21.1 The Contractor shall supply office facilities meeting the following requirements:

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

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

(c) The building shall have a minimum floor area of 20 square metres, with stairs and a door entrance with a suitable lock.

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

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

(f) The building shall be furnished with one desk, one drafting table 3 m x 1.2 m, one stool, one four drawer legal size filing cabinet, one meeting table, and a minimum of 8 chairs.

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

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

(i) Arrange and pay for two (2) cellular phones and one (1) field office telephone in the Contract Administrator's office for his/her exclusive use. Provide two separate land lines for fax machine and computer modems. Long distance calls placed on these phones will be paid by the Contract Administrator.

D21.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

D21.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

D21.4 All the Contractor's temporary structures in this area shall be stabilized by the Contractor in a manner sufficient to prevent overturning by wind forces as per the National Building Code of Canada and designed by a Professional Engineer registered in the Province of Manitoba.

D22. PROTECTION OF EXISTING TREES

D22.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

(a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.

(b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.

(c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

(d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the Work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within

the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

(e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

D22.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his designate.

D22.3 No separate measurement or payment will be made for the protection of trees.

D22.4 Elm trees cannot be trimmed between April 1 and July 31, inclusive.

D23. TRAFFIC CONTROL

D23.1 Further to clauses 3.6 and 3.7 of CW 1130-R1:

(a) Where directed, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. No measurement for payment will be made for this Work.

(b) The Contractor shall make arrangements with Jena Belair (Phone Number 986-5841) of the Traffic Services Section of the City of Winnipeg to make up all temporary regulatory signs required in accordance with the Manual of Temporary Traffic Control. The Contractor shall pick up these signs from the City, install them on site in accordance with the Manual of Temporary Traffic Control, maintain them in good condition, and return them to the City at the end of the project.

(c) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances which have not been set out in the above mentioned manual.

D24. TRAFFIC AND PEDESTRIAN MANAGEMENT

D24.1 Intersecting street and private approach access shall be maintained at all times.

D24.2 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

D24.3 Pedestrian passage must be maintained in a safe manner acceptable to the Contract Administrator. The pedestrian passage shall have a minimum illumination of 10 foot candles, incandescent 100 or 150W light bulbs. Fixtures include vandal-proof bulb guard.

D25. PEDESTRIAN SAFETY

D25.1 During the project, a chain link fence with gates (1829 mm high) shall be installed around the construction area. The Contractor shall be responsible for maintaining the chain link fence in a proper working condition. No measurement for payment shall be made for this Work.

D26. WATER USED BY CONTRACTOR

D26.1 Further to clause 3.7 of CW 1120-R1, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-law. Sewer charges will not be assessed for water obtained from a hydrant.

D27. SURFACE RESTORATIONS

D27.1 Further to clause 3.3 of CW 1130-R1, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

D28. INFRASTRUCTURE SIGNS

D28.1 The Contractor shall obtain infrastructure signs from the traffic Services Sign Shop at 421 Osborne Street. The Contractor shall mount each sign securely to a rigid backing material approved by the Contract Administrator. The Contractor shall fasten each sign to a suitable support and erect and maintain one sign at both ends of the project as directed by the Contract Administrator. When the Contract Administrator considers the Work complete, the Contractor shall remove and dispose of the signs and supports. No measurement for payment will be made for the performing all operations herein described and all other items incidental to the Work described

MEASUREMENT AND PAYMENT

D29. PAYMENT SCHEDULE

D29.1 Further to GC:12, payment shall be in accordance with the following payment schedule:

(a) Custom manufactured items may be included in progress estimates prior to installation on Site based on following payment schedule:

(i) 50% of the bid supply costs, on manufacture and delivery to Site.

(ii) 50% of the bid supply costs on installation.

(iii) 100% of the bid installation costs on installation.

WARRANTY

D30. WARRANTY

D30.1 Notwithstanding GC:13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to GC:13.2.1 or GC:13.2.2, in which case it shall expire when provided for thereunder.

D30.2 Notwithstanding GC:13.2 or D30.1, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:

(a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D30.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in GC:13.2 for the warranty period to begin.

D30.3 At least two (2) weeks prior to the expiration of the Warranty Period, or upon correction of all outstanding defects and deficiencies, whichever is later, the Contractor shall arrange, attend and assist in an acceptance inspection of the Work. The Contract Administrator shall, on being satisfied that all outstanding defects and deficiencies in the Work have been corrected, issue a Certificate of Acceptance for the Work to be dated not earlier than two (2) years after the date of the Certificate of Total Performance, or the date that the Contractor corrects the final defects and deficiencies, whichever is the later, thereby terminating the Warranty Period. The Certificate of Acceptance will indicate acceptance of the due performance of the Contract.

D30.4 Further to the above, the Contractor shall supply warranties as identified in E13.6, E13.7, E14.4, E14.5 and E18.5.2 prior to issue of Certificate of Total Performance.

D31. SHOP DRAWINGS

D31.1 Further to GC:6.9, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract or as may reasonably be required by the Contract Administrator.

D31.2 The Contractor shall review all Shop Drawings prior to submitting same to the Contract Administrator. By this review, the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data, and that he has checked and coordinated each Shop Drawing with the requirements for the Work and of the Contract. The Contractor's review of each Shop Drawing shall be certified by stamp, date and signature in the manner stipulated by the Contract Administrator.

D31.3 The Contractor shall promptly submit Shop Drawings to the Contract Administrator in an orderly sequence to prevent delay in the Work or in the Work of other contractors. At the time of submission, the Contractor shall notify the Contract Administrator of any deviations in the Shop Drawings from requirements of the Contract. The Contractor shall allow one week for the Contract Administrator's review.

D31.4 The Contract Administrator shall review the Shop Drawings promptly or in accordance with a schedule agreed upon in writing. The Contract Administrator, upon completion of the review, shall communicate either his acceptance or rejection of the Shop Drawings to the Contractor. The Contract Administrator's review and acceptance shall be for conformity to the design concept of the Work and for compliance with the Contract.

D31.5 The acceptance of the Shop Drawings for a component or a subassembly shall not constitute acceptance of the assembly of which it is a part.

D31.6 The review shall not relieve the Contractor of responsibility for errors and omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract unless a deviation on the Shop Drawings, identified by the Contractor, has been approved by the Contract Administrator.

D31.7 The Contractor shall promptly make any changes in the Shop Drawings which the Contract Administrator may require and which are consistent with the Contract and shall promptly resubmit same to the Contract Administrator for review and acceptance unless otherwise directed by the Contract Administrator. When resubmitting the Shop Drawings, the Contractor shall notify the Contract Administrator of any revisions other than those requested by the Contract Administrator.

D31.8 No Work called for by Shop Drawings shall be undertaken by the Contractor until the Contract Administrator's review is completed and the acceptance of same has been communicated to the Contractor.

D31.9 Each Shop Drawing shall:

(a) be sheet size ISO A4.

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

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

(i) the project title

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

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

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

(v) the Specification section number (if applicable)

(vi) the option proposed (if applicable)

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

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

D32. RED RIVER NAVIGATION PROTECTION

D32.1 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.

D32.2 Prior to commencing any Works or operations involving the use of equipment in or above the river (Work bridges construction, falsework or formwork, structural concrete, precast concrete, deck drain Works, steel coating, and all other applicable operations incidental to the Work of this contract), 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).

D32.3 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.

D32.4 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.

D33. ENVIRONMENTAL PROTECTION PLAN

D33.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Plan as herein specified.

D33.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work and are available for viewing at the office of the Contract Administrator.

(a) Federal

(i) Canadian Environmental Assessment Act (CEAA) c.37

(ii) Fisheries Act C.F14

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

(iv) Navigable Waters Protection Act

(b) Provincial

(i) The Dangerous Goods Handling and Transportation Act D12
(ii) The Endangered Species Act E111
(iii) The Environment Act c.E125
(iv) The Fire Prevention Act F80
(v) The Manitoba Heritage Resources Act H39-1
(vi) The Manitoba Noxious Weeds Act N110
(vii) The Manitoba Nuisance Act N120
(viii) The Public Health Act c.P210
(ix) The Workplace Safety and Health Act W210
(x) And current applicable associated regulations (Note: Provincial regulations updated as of September 1999).
(xi) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.

(c) Municipal

(i) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000.
(ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000.
(iii) And any other applicable Acts, Regulations, and Bylaws.

D33.3 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

(i) Storage of construction materials shall be confined to the defined laydown areas as shown on the Contract Drawings.
(ii) Construction materials shall not be deposited or stored on riverbanks or river shorelines unless written acceptance from the Contract Administrator is received in advance.
(iii) Construction materials and debris shall be prevented from entering the Red River. In the event that materials and/or debris inadvertently enter the watercourse, the Contract shall be required to remove the material and restore the watercourse to its original condition.
(iv) Metallizing overspray shall be contained by wrapping drop sheet tarpaulins around areas to be coated.
(v) Storage, mixing, and transfer of paints shall be carried out on land and not on or under the bridge.

(b) Fuel Handling and Storage

(i) The Contractor shall obtain all necessary permits from Manitoba Environment for the handling and storage of fuel products and shall provide copies to the Contract Administrator.
(ii) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.
(iii) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.

(iv) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke and are located a minimum distance of 100 metres away from the high water line of the Red River. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervious material. If this type of material is not available, the dyke shall be constructed of locally available material and lined with high-density polyethylene (HDPE). Furthermore, the fuel storage area(s) shall be secured by a barrier such as a high fence and gate to prevent vandalism.

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

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

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

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

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

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

(c) Waste Handling and Disposal

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

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

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

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

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

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

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

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

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

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

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

(iv) Different waste streams shall not be mixed.

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

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

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

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

(ix) Dangerous goods/hazardous waste storage areas shall be located at least 100 metres away from the high water line and be dyked.

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

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

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

(e) Emergency Response

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

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

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

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

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

ii. Attend to public safety:
- stop traffic, roadblock/cordon off the immediate danger area
- eliminate ignition sources
- initiate evacuation procedures if necessary

iii. Assess situation and gather information on the status of the situation, noting:
- personnel on site
- cause and effect of spill
- estimated extent of damage

- amount and type of material involved
- proximity to waterways, sewers, and manholes

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

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

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

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

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

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

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

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

Table 1
Spills That Must be Reported to the
Manitoba Conservation as Environmental Accidents

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

Table 1 **Spills That Must be Reported to the** **Manitoba Conservation as Environmental Accidents**		
Classification	**Hazard**	**Reportable Quantity/Level**
9.1	PCB Mixtures	500 g
9.2	Aquatic Toxic	1 kg or 1 L
9.3	Wastes (chronic toxic)	5 kg or 5 L
*Container capacity (refers to container water capacity) **PG = Packing Group(s)		

(f) Noise

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

(ii) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable limits. The Contractor shall also demonstrate to the Contract Administrator that Works to be preformed during the night-time period, on Sundays, and Holidays as stated in the Licence shall not exceed the approved limit.

(g) Dust

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

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

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

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

(h) Riprap

(i) All areas of the Red River banks disturbed by construction activities shall be riprapped with rock to limit erosion and sedimentation into the rivers.

(ii) Riprap shall be free of fine materials prior to placement.

(i) Erosion Control

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

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

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

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

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

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

(j) Runoff Control

(i) Measures shall be undertaken to ensure that runoff containing suspended soil particles is minimized from entering the Red River to the extent possible to the satisfaction of the Contract Administrator.

(ii) Areas that are heavily disturbed and vulnerable to erosion or gullying shall be dyked to redirect surface runoff around the area prior to spring run-off.

(iii) Construction activities on erodible slopes and riverbanks shall be avoided during spring run-off and heavy rainfall events.

(iv) Soil and fill shall not be stockpiled on immediate riverbank areas.

(k) Bank Stabilization

(i) The banks of the Red River shall be stabilized from channel level to high water elevation at bank-full conditions at the completion of construction.

(l) Aquatic Resources

(i) The Contractor shall adhere to the Manitoba Conservation guidelines titled Recommended Fish Protection for Stream Crossings in Manitoba.

(ii) All construction activities that may impact the Red River stream channel and which may affect fish mobility and fish habitat shall cease from April 1 to June 1 of each year during construction.

(iii) The use of creosoted timbers in the river channel is not permitted.

(m) Vegetation

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

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

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

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

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

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

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

(n) Landscaping

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

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

(o) Construction Traffic

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

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

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

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

(p) Access

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

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

FORM H1: PERFORMANCE BOND
(See D10)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

_____ day of _____ , 20____ , for:

BID OPPORTUNITY NO. 257-2005

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

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

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 257-2005

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

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

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D11)

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

Name	Address

FORM K: EQUIPMENT
(See D12)

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D12)

REDWOOD BRIDGE
REHABILITATIVE MAINTENANCE AND RELATED WORKS

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

Drawing No.	Drawing Name/Title
	Cover Sheet
	General Drawings
B113-05-01	Cover Sheet and Location Plan
B113-05-02	Design Data and Drawing List
B113-05-03	Limits of Work and Location of Proposed New Work
B113-05-04	Site Access and Storage Areas
B113-05-05	General Arrangement
B113-05-06	Pedestrian Access Routing
	Substructures-Abutments and Piers
B113-05-07	West Abutment, Existing Elevations, Plans and Sections
B113-05-08	West Abutment Layout, Proposed Concrete Plan, Elevations, Sections and Details
B113-05-09	West Abutment, Reinforcing Steel Details I
B113-05-10	West Abutment, Reinforcing Steel Details II
B113-05-11	East Abutment, Existing Elevations, Plans and Sections
B113-05-12	East Abutment Layout, Proposed Concrete Plan, Elevations, Sections and Details
B113-05-13	East Abutment, Reinforcing Steel Details I
B113-05-14	East Abutment, Reinforcing Steel Details II
B113-05-15	Pier #2, Concrete Removal, Encasement and Reinforcing Steel Details
B113-05-16	Pier #2, Pier Cap Concrete Modifications and Reinforcing Steel Details
B113-05-17	Pier #2, Concrete Removal, Encasement and Reinforcing Steel Details
B113-05-18	Pier #4 and Pier #5, Concrete Removal, Encasement and Reinforcing Steel Details
B113-05-19	Pier #4, Pier Cap Concrete Modifications and Reinforcing Steel Details
	Bearings
B113-05-20	Bearing Layout Plan and Bearing Details
B113-05-21	West and East Abutments, Bearing Details
B113-05-22	Pier #2, Bearing Details
B113-05-23	Pier #4, Bearing Details
B113-05-24	Pier #5, Bearing Details
	Superstructure-End Floor Beams, Sidewalk Brackets
B113-05-25	Bridge End Floor Beam Replacement Key Plan
B113-05-26	Bridge Section-Span 1, West End Floor Beam Details
B113-05-27	Bridge Section-Span 1, East End Floor Beam Details
B113-05-28	Bridge Section-Span 2 and 3, End Floor Beam Details
B113-05-29	Bridge Section-Span 4, West End Floor Beam Details
B113-05-30	Bridge Section-Span 4, East End Floor Beam Details
B113-05-31	Bridge Section-Span 5, West End Floor Beam Details

Drawing No.	Drawing Name/Title
B113-05-32	Bridge Section-Span 5, East End Floor Beam Details
B113-05-33	Steel Sidewalk Bracket Replacement Key Plan
B113-05-34	Steel Sidewalk Bracket Replacement, Bracket Detail I
B113-05-35	Steel Sidewalk Bracket Replacement, Bracket Detail II
B113-05-36	Steel Sidewalk Bracket Replacement, Bracket Detail III
B113-05-37	Steel Sidewalk Bracket Replacement, Bracket Detail IV
B113-05-38	Steel Sidewalk Bracket Replacement, Bracket Detail V
B113-05-39	Steel Sidewalk Bracket Replacement, Bracket Detail VI
	Bridge Deck, Sidewalks, Deck Drains, Expansion Joints and West Approach Slab
B113-05-40	Span 1, 2 and 3, Deck Slab Reinforcing Details
B113-05-41	Span 4 and 5, Deck Slab Reinforcing Details
B113-05-42	Deck Slab Reinforcing, Details I
B113-05-43	Deck Slab Reinforcing, Details II
B113-05-44	Sidewalk Penetration Closure, Details I
B113-05-45	Sidewalk Penetration Closure, Details II
B113-05-46	Sidewalk Penetration Closure, Details III
B113-05-47	Deck Drain Sections and Details
B113-05-48	Expansion Joint Details
B113-05-49	West Approach Slab Concrete and Reinforcing Steel Details
	Bridge Shoulder Barrier, Pedestrian Railings and Access Ladders
B113-05-50	North Aluminum Bridge Shoulder Barrier, Post Layout Elevations
B113-05-51	South Aluminum Bridge Shoulder Barrier, Post Layout Elevations
B113-05-52	Aluminum Bridge Shoulder Barrier, Post and Rail Details
B113-05-53	Aluminum Bridge Shoulder Barrier, Bill of Materials and General Notes
B113-05-54	Aluminum Pedestrian Handrail, Layout and Elevations
B113-05-55	Aluminum Pedestrian Handrail, Elevations, Sections and Details
B113-05-56	Aluminum Pedestrian Handrail, Life Preserver Enclosure, Elevations, Sections and Details
B113-05-57	Pier #2, #3, #4 and #5, Access Ladder and Safety Railing Details
	Surface Preparation and Coating of Existing Structural Steel
B113-05-58	Surface Preparation and Coating of Existing Structural Steel, Option I
B113-05-59	Surface Preparation and Coating of Existing Structural Steel, Option II
	Miscellaneous Repairs
B113-05-60	Miscellaneous Bridge Repairs, Plan, Sections and Details
	Reinforcing Schedules
B107-05-61	West Abutment, Reinforcing Steel Schedule
B113-05-62	West Abutment and East Abutment, Reinforcing Steel Schedule
B113-05-63	East Abutment and West Approach Slab, Reinforcing Steel Schedule
B113-05-64	Pier #2, Reinforcing Steel Schedule
B113-05-65	Pier #2 and Pier #3, Reinforcing Steel Schedule
B113-05-66	Pier #4, Reinforcing Steel Schedule
B113-05-67	Pier #5, Reinforcing Steel Schedule
B113-05-68	Deck Slab, Curbs and Sidewalk Penetration Closures, Reinforcing Steel Schedule
	Electrical
B113-03-01	Electrical Plan, Sections and Details
	Roadworks
B113-05-70	West Approach Pavement Reconstruction, Removals, Horizontal & Vertical Alignment, 0+100 to West Expansion Joint
B113-05-71	East Approach Pavement Resurfacing, Removals, Horizontal & Vertical Alignment, East Expansion Joint to 0+500
B113-05-72	West Approach Pavement Resurfacing, Aluminum Balanced Barrier Rail, Post, Rail & Curb Transition Layout
B113-05-73	East Approach Pavement Resurfacing, Aluminum Balanced Barrier Rail, Post, Rail & Curb Transition Layout
B113-05-74	West & East Pavement Approaches, Aluminum Balanced Barrier Rail, Post, Rail & Curb

Drawing No.	Drawing Name/Title
	Transition Details

E2. VERIFICATION OF WEIGHTS

E2.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

E2.1.1 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

E2.1.2 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

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

(b) Observing weighing procedures.

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

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

E2.1.3 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. MOBILIZATION AND DEMOBILIZATION

E3.1 Description

E3.1.1 This Specification covers all operations relating to the mobilization and demobilization of the Contractor to the site, as specified herein.

E3.2 Construction Method

E3.2.1 Section includes, but is not limited to:

(a) Cellular Telephone Communication

The Contractor's site supervisor is required to carry, at all times, a cellular telephone equipped with voicemail.

(b) Miscellaneous

This section shall also include travel and accommodation, set-up, and demobilization of site offices, storage conveniences, and other temporary facilities, construction plant, and other items not required to form part of the permanent Works and not covered by other prices.

E3.3 Method of Measurement

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

E3.4 Basis of Payment

Mobilization and demobilization will be paid for at the Contract Lump Sum Prices for "Mobilization and Demobilization for Pier Encasements and Mobilization and Demobilization for Remainder of Work".

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

(a)	when Contractor Administrator is satisfied that construction has commenced	30%
(b)	during construction	60%
(c)	upon completion of the project	10%

E4. PEDESTRIAN AND TRAFFIC PROTECTION/ACCOMMODATION

E4.1 Description

E4.1.1 This Specification shall cover the provision of protection and guidance for pedestrians crossing Redwood Bridge from all construction operations during the entire period for the Work of this Contract, as specified herein.

E4.1.2 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.

E4.2 Materials for Protection and Guidance Requirements

E4.2.1 General

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

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

E4.2.2 Pedestrian Protection

The pedestrian protection wall shall be a minimum of 2400 mm high and shall consist of support posts and minimum 13 mm thick plywood. The support posts shall have provision for anchorage to prevent movement or overturning of the pedestrian protection due to wind. The pedestrian protection shall be designed for all applicable loading including wind loading in accordance with the requirements of the National Building Code. Adequate lighting shall be provided attached to the temporary pedestrian protection or attached to the bridge trusses.

E4.2.3 Temporary Support for Pedestrian Sidewalk

The existing sidewalk utilized to accommodate pedestrian traffic during construction will require additional temporary supports when end floor beams are being replaced at piers 2, 4 and 5. These supports shall be designed by the Contractor's Engineer for all applicable loading including wind loading in accordance with the requirements of the National Building Code and

vertical loading from the existing sidewalk stringers as specified on the drawings. These supports shall also be designed to accommodate differential movement of the sidewalk stringers relative to the piers (for thermal movement and for repositioning of span 4).

E4.2.4 Traffic Gates

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

E4.3 Construction Methods

E4.3.1 Scope of Work

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 and pedestrian sidewalk as specified herein.
ii) Provision of all signage necessary to direct pedestrian traffic.
iii) Provision of adequate security on the bridge (security guard(s).
iv) Provision of all other measures necessary to ensure safe pedestrian access across the bridge to the satisfaction of the Contract Administrator.

E4.3.2 Pedestrian Protection and Temporary Sidewalk

E4.3.2.1 Installation/Removal of Pedestrian Protection and Temporary Sidewalk

The pedestrian protection and sidewalk shall be erected prior to the commencement of any Work that would affect pedestrian traffic and to the satisfaction of the Contract Administrator.

The pedestrian protection 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.

4.3.2.2 Shop Drawings

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.

The shop drawings shall consist of: three (3) sets of prints, one (1) reproducible sepia set.

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.

The Contractor shall determine the Work area extents and the associated pedestrian protection and temporary sidewalks required prior to submission of the pedestrian protection and temporary sidewalk shop drawings.

4.3.2.3 Safety Precautions

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

4.3.2.4 Maintenance of the Pedestrian Protection and Temporary Sidewalk

The Contractor shall maintain the pedestrian protection 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.

The walkway shall be kept free of all construction materials, debris and equipment at all times.

E4.4 Method of Measurement

Pedestrian and traffic protection/accommodation will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E4.5 Basis of Payment

Pedestrian accommodation will be paid for at the Contract Lump Sum price for "Traffic and Pedestrian Control", pro-rated on a weekly basis over the construction period, 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.

Pro-rated payment will be based on the following breakdown:

Installation	40%
Maintenance	30%
Removal	30%

E5. LANDSCAPE RESTORATION

E5.1 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-R8 and CW 3520-R6.

E5.2 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 following supply and placement

(b) Twenty-five (25) percent following termination of the maintenance period

E6. STRUCTURAL REMOVALS

E6.1 Description

This Specification shall cover structural removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, dismantlement, and disposal of applicable materials.

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 Equipment

E6.2.1 General

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

E6.3 Construction Methods

E6.3.1 Scope of Work

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.

(a) Concrete Removals – Removal and disposal of all concrete Works to the limits shown on the Drawings, from the existing Redwood Bridge structure including concrete deck, asphalt overlay, piers and abutment partial depth concrete removal, sidewalks, approach slab, including all reinforcing steel, embedments, attachments, waterproofing items, other removal and disposal of miscellaneous buried structures will be considered for removal upon acceptance of the Contract Administrator.

(b) Steel Removals – Removal and disposal of all steel Works to the limits shown on the Drawings, from the Redwood Bridge structure including end floor beams, pedestrian handrail, sidewalk brackets with top and bottom connection plates, catwalk, cable support structures, drive shafts and gears, bearings.

(c) Wood Removal – Removal and disposal of all wooden Works including sidewalk planks, blocking, wooden curbs, deck, and blocking.

(d) Electrical Cabling and Device Box Removals – Removal and disposal of all used cabling and device boxes on the bridge.

(e) Miscellaneous Metal Removal – Miscellaneous removals and disposal of such items as rivets, angles and brackets necessary for the Work of this Contract shall be incidental to the Work for which such removals are required, whether or not specifically identified in these Specifications. No separate measurements or payments will be made for such items.

(f) Salvage Items – Removal and salvaging of the catwalk, navigation lights including cages and aluminum traffic barrier rails and posts.

E6.3.2 Fees and Permits

The Contractor shall obtain and pay for all licenses and permits necessary for the removal Work.

The Contractor shall comply with all Municipal, Provincial, and Federal Government regulations relating to the demolition of structures.

E6.3.3 Explosives

The use of explosives is prohibited.

E6.3.4 Protection of Existing Structures and Services

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.

E6.3.5 Safety Precautions

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.

E6.3.6 Traffic and Pedestrian Control

Traffic and pedestrian control shall conform to E4. Pedestrian and Traffic Protection/Accommodation.

E6.3.7 Structure Removal Schedule and Procedures

At least ten (10) 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.

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

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

The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on-site will be allowed without written approval of the Contract Administrator.

It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

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.

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.

The Contractor shall be responsible for any damage to items marked for salvaging.

E6.3.8 Structural Removal Methods

6.3.8.1 General

Structural removals shall be deemed to include all the items of Work as listed under Clause E6.3.1, "Scope of Work", of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.

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.

6.3.8.2 Access/Work Platforms

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

6.3.8.3 Details of Existing Structures

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.

6.3.8.4 Protection of Roadways and Walkways

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.

6.3.8.5 Concrete Removals

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

For partial removal of concrete, edges shall be sawcut to clean and straight lines.

6.3.8.6 Steel Removals

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

6.3.8.7 Wood Removals

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

6.3.8.8 Salvage Items

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

E6.4 Method of Measurement

E6.4.1 Structural Removals

Structural Removals, except for concrete removals >150 mm deep, as defined in this Specification, will be paid for on a lump sum basis as accepted by the Contract Administrator and no measurement will be made for this Work. Structural removals, for concrete removals >150 mm deep, as defined in this Specification, will be paid for on a square metre basis as accepted by the Contract Administrator, and as measured on site by the Contract Administrator.

E6.5 Basis of Payment

E6.5.1 Structural Removals

Structural Removals, except for concrete removals > 150 mm deep, will be paid for at the Contract Lump Sum Price for the "Items of Work," listed herebelow, 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.

All structural removal materials not marked for salvage reverts to the Contractor for disposal.

Items of Work:
Structural Removals

a) Concrete Removals to 150 mm deep]
b) Concrete Removals > 150 mm deep*
c) Steel Removals
d) Wood Removals
e) Electrical and Device Box Removals
f) Salvage Items

*Concrete removals > 150 mm deep 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.

E7. STRUCTURAL EXCAVATION

E7.1 Description

This Specification shall cover all operations related to clearing, grubbing, and structural excavation for substructure, abutment Works, approach slab, approach roadway slabs, and sidewalk slabs, as herein specified and as indicated on the Drawings.

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 Materials

E7.2.1 General

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

E7.2.2 Testing

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

E7.2.3 Excavation

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

E7.3 Equipment

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

E7.4 Construction Methods

E7.4.1 Scope of Work

The Work shall comprise:

(a) The design, fabrication, erection, and removal of all temporary shoring, temporary slope retention walls, sheet piling, and such temporary protective measures as may be required to construct the Works.

(b) The excavation of all material required to construct the Works, including clearing and grubbing.

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

(d) Dewatering of all excavations, as required, for the abutment Works, approach slab, approach roadway slabs, and sidewalk slabs.

E7.4.2 Excavation

The shored excavations shall be made in a manner such that all abutment Works may be properly constructed to the required depths and without reduction of dimensions as shown on the Drawings.

The dimensions of the shored excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal and the construction of cutoff trenches and/or sumps to permit the pumping of water outside the limits of the excavations.

Excavations shall be completed to the elevations required to construct the Works or to such other elevations as may be directed by the Contract Administrator in the field. Excavation sequence shall be done in a “top down” direction, in order to maintain stability.

All material shall be brought to the surface by approved method, and shall be disposed of away from the site and not into the existing river channel.

Shored excavations shall be dewatered and maintained dewatered so that the material is excavated in its natural state. The bottom of the excavation shall be kept free from excessive moisture or free-flowing water.

E7.4.3 Inspection

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

E7.4.4 Alterations to Site

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

E7.4.5 Protection of Existing Riverbanks, Channel, and Embankment Slopes

The Contractor shall not disturb the riverbanks, channel, and embankment slopes outside the excavation limits and shall not dump excavated material into the channel or onto the riverbank.

E7.4.6 Excess Material

All excavated material shall become the property of the Contractor and shall be removed from the site. Excavated material shall not be disposed of in a manner that will obstruct the flow of watercourses. During freezing weather, the excess material shall be disposed of before it freezes.

E7.5 Method of Measurement and Payment

E7.5.1 Excavation

Excavation for bridge Work will be considered incidental to all portions of the Work requiring excavation. No separate measurement or payment will be made for Work within this section.

All costs for excavation covered in this item shall be included within, but not limited to, the unit prices:

(a) Abutment Concrete

(b) Approach Slab Concrete

(c) Long Stone Rip Rap at East Abutment

E8. STRUCTURAL BACKFILL

E8.1 Description

This Specification shall cover backfill for abutments, large stone rip rap at east abutment, approach slabs, approach roadway slabs, and sidewalk slabs as specified herein.

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.

E8.2 Materials

E8.2.1 General

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

E8.2.2 Handling and Storage of Materials

All materials shall be handled and stored in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator.

Under no circumstances will stockpiling of backfill materials be allowed on the riverbank.

E8.2.3 Testing

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

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

E8.2.4 Granular Backfill

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

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

E8.2.5 Clay Backfill

Clay backfill for structures shall be of a type accepted by the Contract Administrator.

E8.3 Equipment

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

E8.4 Construction Methods

E8.4.1 Scope of Work

The Work shall comprise of the supply, placement, and compaction of backfill material for abutments, approach slab, approach roadway slabs, and sidewalk slabs, as shown on the Drawings.

E8.4.2 Backfill Operations

8.4.2.1 General

The Contract Administrator shall be notified at least one (1) working day in advance of any backfilling operations. No backfill shall be placed against any concrete until accepted by the Contract Administrator and in no case before test cylinders show the concrete strength to be at least 20 MPa. All dampproofing and drain installations must also be completed prior to backfilling.

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

8.4.2.2 Placing of Backfill

All backfill material shall be supplied, placed, and compacted in lifts of 150 mm (maximum) to a minimum of 100% of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time.

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

E8.5 Quality Control

E8.5.1 Inspection

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

E8.5.2 Access

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

E8.5.3 Materials

All material supplied and placed under this Specification shall be subject to testing and acceptance by the Contract Administrator in accordance with Clauses E:8.2 of this Specification.

E8.5.4 Quality of Backfill Material

The Standard Proctor Density for granular and clay backfill material shall be determined at the optimum moisture content in accordance with standard laboratory Proctor Compaction Test Procedure. The field density of each backfill layer shall be a percentage of the applicable Proctor Density, as specified in Clause E:8.4.2.2 of this Specification.

Quality control tests will be used to determine the acceptability of each backfill layer, as placed and compacted by the Contractor before any succeeding layer may be applied.

The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D155560-64, Test for Density of Soil in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.

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

Holes made by removal of samples from the layers shall be promptly filled by the Contractor with appropriate material and thoroughly compacted so as to conform in every way with the adjoining compacted material.

E8.5.5 Corrective Action

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

E8.6 Method of Measurement and Payment

E8.6.1 Structural Backfill

The Supply, Placement, and Compaction of Structural Backfill for bridge Work will be considered incidental to all portions of the Work requiring structural backfill. No separate measurement or payment will be made for Work within this section.

All costs for structural backfill covered in this section shall be included within, but not limited to, the following items, and found in the unit prices:

(a) Abutment Concrete

(b) Approach Slab Concrete

(c) Approach Roadway Slabs

(d) Large Stone Rip Rap at East Abutment

E9. STRUCTURAL STEEL

E9.1 Description

This Specification shall cover the supply, fabrication, transportation, handling and erection of structural steel end floor beams, sidewalk brackets, miscellaneous bridge repairs, and all incidental structural steel elements, components and fasteners, as specified herein.

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.

E9.2 Materials

E9.2.1 General

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.

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

E9.2.2 Structural Steel

All structural steel (excluding shear connector studs) for the end floor beams, stiffeners, brackets and incidental structural steel elements shall conform to the requirements of CSA Standard CAN/CSA - G40.21-98, Grade 350WT.

All structural steel for the sidewalk brackets, top and bottom connection plates, supporting beams, edge angles, channels, ice breaker, HSS shall conform to the requirements of CSA Standard CAN/CSA-G40.21-M98, Grade 350W.

Plate steel from coils will not be permitted.

Edges of all plates shall be subject to visual inspection, and any plates found to include laminations shall not be used on the Work.

E9.2.3 Hot-Dip Galvanizing

All steel items supplied under this Specification shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a retention of 600 gm/m^2 after fabrication unless specified otherwise.

E9.2.4 Galvanizing Touch-up

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 A780-00 for "Repair of Damaged Hot Dip Galvanizing Coatings". Accepted products are Galvalloy as 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.

E9.2.5 Welding Consumables

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:

(a) 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.

(b) 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 ER480S-X or imperial equivalent.

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

(d) Submerged Arc Welding (SAW):

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

(e) 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.

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

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.

E9.2.6 High-Strength Bolts, Nuts and Washers

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.

E9.2.7 Shear Connector Studs

Shear connector studs shall be 19-mm diameter, 106-mm long for connecting sidewalk to supporting beams, 22 mm diameter 150 mm long for ice breaker Nelson type S3L Studs, made from cold-drawn steel grades C-1010 through C-1020 in accordance with ASTM A-108, Grade 1020, and shall be welded in accordance with the manufacturer's recommendation.

E9.2.8 Caulking

Caulking shall be Sikaflex 1A, complete with Sikaflex 205 Primer, or equal as accepted by the Contract Administrator.

E9.3 Equipment

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

E9.4 Construction Methods

E9.4.1 Scope of Work

It is intended that this Specification covers the following structural steel Works including all components and related fasteners:

(a) End floor beams (5) including stiffeners, brackets, and brackets on existing end floor beams at west abutment, pier #2 west, and east abutment.

(b) Sidewalk brackets including top and bottom connection plates, filler plates, supporting beams, edge angles, channels, flat bars (drips), HSS.

(c) Miscellaneous bridge repairs including cover plates for vertical and diagonal member of trusses, bearings retaining plates.

E9.4.2 Fabrication

E9.4.2.1 General

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.

No fabrication or welding of steel Work shall commence until permission to do so has been received from the Contract Administrator.

The procedure for the repair of any members damaged during fabrication shall be accepted by the Contract Administrator prior to any Work taking place.

E9.4.2.2 Submissions

At least twenty-one (21) working 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 acceptance.

At least twenty-one (21) working days prior to the scheduled installation of structural steel, the installation methods and equipment shall be submitted to the Contract Administrator for his acceptance.

E9.4.2.3 Shop Drawings

The shop drawings shall consist of three (3) sets of prints, one (1) reproducible sepia set and an electronic copy.

The shop drawings shall clearly show shapes, weights, dimensions, details, connections (including proper AWS welding identification), bolt holes, accessories and erection procedures.

The Contractor shall field measure all dimensions as required prior to submission of the structural steel shop drawings.

Calculated mass of structural steel for each shop drawing following shop drawing final acceptance shall be submitted.

E9.4.2.4 Preparation of Material

(a) 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 E9.4.2.17. 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) Camber

Beams shall be cambered as indicated on the Drawings.

The required camber shall be produced within the tolerances as set out in CSA Standard W59-M1989. The fabricator shall record measurements of the actual camber of each beam, at the points indicated on the Drawings.

If the shop-measured actual camber of a beam is not within the tolerances as set out in CSA Standard W59-M1989, the Contract Administrator shall be so informed immediately, the fabricator shall submit a record of the actual camber of any such beam and a proposal as to possible corrective measures. No remedial measures shall be undertaken by the fabricator until his proposal has been given due consideration and has been accepted in writing by the Contract Administrator.

(c) 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.

All flange plates shall be cut so that the direction of applied stress is parallel to the direction of plate rolling.

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 flange section thicker than	25 mm

Edges may be prepared by oxygen cutting, providing 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 acceptable to the Contract Administrator.

All flange plates prepared by flame cutting shall be preheated in accordance with Clause E9.4.2.10.

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. Occasional gouges will be tolerated only at the discretion of the Contract Administrator and shall be repaired in accordance with his instruction.

(d) Edge Preparation (Nonwelded Edges)

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.

Sheared edges of plates more than l6 mm in thickness shall be planed to a depth of 6 mm.

Any flame cutting of steel shall be in accordance with Clause E9.4.2.4(c).

Special attention shall be given to the cutting of coverplates or flange plates. Occasional gouges not in excess of 6 mm deep will be accepted in areas of low stress at the discretion of the Contract Administrator. The repair or removal of such gouges shall be to the Contract Administrator's instructions.

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.

E9.4.2.5 Bolt Holes

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.

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.

Drilling shall be done with twist drills. Burrs on the outside surfaces shall be removed.

Poor matching of holes will be cause for rejection.

E9.4.2.6 Shear Connector Studs

Welding of shear connector studs shall conform to the requirements of CSA Standard W59-M1989, Section 3.1.2.2 and 5.5.6.

E9.4.2.7 Assembly and Welding Sequences

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

E9.4.2.8 Marking

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

E9.4.2.9 Assembly

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.

Tack welding shall be done by qualified operators, using the smallest size weld required to hold the components of the assembly together. Tack welds shall not be less than 50 mm in length and shall be incorporated in the final weld.

Tack welds shall be made with 4 mm maximum size electrodes and shall be subject to the preheat requirements of Clause E9.4.2.10.

E9.4.2.10 Preheat and Interpass Temperatures

No welding shall be done when the ambient temperature 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 E9.1.

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 E9.1.

Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.

For all welding processes, preheat and interpass temperatures shall be maintained during welding, at temperatures not less than stated in Table E9.1.

TABLE E9.1
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
38 mm to 64 mm	65°C
Over 64 mm	107°C

Preheat temperatures above the minimum shown in Table E9.1 may be required for highly restrained joints if designated by the Contract Administrator.

Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.

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.

E9.4.2.11 Welding

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.

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.

Where the submerged arc or gas metal arc processes are to be used, the Contract Administrator may order that:

A preliminary test run of the accepted procedure be made over the length of the joint to prove that the disposition of the equipment, the handling of hoses, and the method and accuracy of travel are satisfactory.

Each operator make a weld specimen not less than 1.2 m in length for fillet welds and 150 mm in length for butt welds. Steel of the same specification and thickness as that to be used in the Work shall be used in the specimen welds. No welding shall be done on the Work until such a specimen is satisfactory to the Contract Administrator.

Materials to be used for backing strips and runoff tabs shall conform to the same specifications as the base material.

Butt welds shall be extended beyond the edges of the parts to be joined by means of start and runoff tabs providing sufficient thickness to avoid the weld burning through and with a joint preparation similar to that on the main material. For manual shielded metal arc welding, the width of the tabs shall be not less than the thickness of the thicker part being joined or 75 mm, whichever is greater. For submerged arc welding, the width of the tabs shall be not less than 75 mm. Each weld pass shall be carried far enough beyond the edge of the parts being joined to ensure sound welds in the joint. Tabs shall be removed upon completion and cooling of the weld without damage to the parent plate and the end of the weld made smooth and flush with the edges of the abutting parts.

In gas metal arc welding, the equipment shall be capable of sustaining a gas flow rate of from 0.85 to 1.27 m^3 per hour (30 to 45 ft^3 per hour).

Mechanical scaling tools shall not be used on any weld surface that is a final weld surface. Scaling tools may be used on welded passes provided their use does not crack or injure the first pass of a multipass weld.

Semiautomatic machines may be used only when they are equipped with a mechanical control of travel speed.

Repairs to welds of base metal shall be made by grinding or arc air-gouging followed by grinding. The use of flame gouging or oxygen gouging will not be permitted.

E9.4.2.12 Weld Profiles

Weld profiles shall meet the requirements of CSA Standard W49-1989 Clause 5.9.

E9.4.2.13 High-Strength Bolt Installation

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.

Sufficient bolts, nuts and washers shall be furnished to complete the entire structure with an ample surplus to replace all bolts damaged or lost.

E9.4.2.14 Bent Plates

When bending plates, the plates shall be so taken from the stock plates that the bend line will be at right angles to the direction of rolling. The radius of the bend measured inside, shall be not less than the thickness of the plate.

Before bending, the corners of the plate shall be rounded to a radius of 2 mm throughout that portion of the plate at which bending is to occur.

E9.4.2.15 Machined Surface

Machine finished surfaces, as designated on the Drawings, shall be coated with an accepted protective compound.

E9.4.2.16 Shop Assembly

A shop trial assembly of field bolted connections is to be done. The assembly, alignment, and accuracy of holes shall be accepted by the Contract Administrator before reaming is recommended.

E9.4.2.17 Dimensional Tolerances

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.

Deviation from specified camber at centre of beam: in accordance with CSA Standard W59-M1989, Clause 5.8(c).

Lateral deviation on H or I members: ± 6 mm.

Deviation from flatness of girder webs measured between flanges or between stiffeners: As per CSA Standard W59-M1989, Clause 12.5.3.

Combined warpage and tilt of flanges of girders, determined by measuring the offset between the end of the flange plate and the flange plate at the centre of the web plate: As per CSA Standard W59-1989, Clause 5.8(f).

This tolerance does not apply to the following cases:

(i) Abutting parts of flanges to be butt welded, which shall meet the requirements of CSA Standard W59.1-M1989, Clause 5.4.4.

(ii) Flange plates at bearings shall meet the requirements of the following clause:

- Flanges of members at bearings shall not be out of square with the theoretical vertical axis of the member. The flange plate shall have full contact with the bearing sole plate.

Deviation from specified depth: As per CSA Standard W59-M1989, Clause 5.8 (j).

Intermediate Stiffeners: As per CSA Standard W59.1-M1989, Clause 5.8 (k).

Bearing Stiffeners: As per CSA Standard W59.1-M1989, Clause 5.8 (l).

The maximum deviation from the specified length measured on centreline of web: ± 6 mm.

E9.4.2.18 Shipping

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.

All necessary haulage permits shall be obtained by the Contractor from the proper authorities prior to transportation by vehicles of any structural members.

E9.4.2.19 Delivery

The Contractor shall be responsible for arranging directly, with the appropriate authorities, a route and schedule acceptable to them; the Contractor shall keep the authorities and Contract Administrator advised and obtain the authorities' approval on any changes as the project proceeds.

Railway cars or vehicles containing materials shall be promptly unloaded by the Contractor upon delivery and, in case of failure to do so, the Contractor shall be liable to any demurrage charge.

E9.4.3 Erection

E9.4.3.1 Erection of Structural Steel

The Contractor shall obtain the Contract Administrator's acceptance on erection procedures and scheduling prior to the commencement of erection of structural steel.

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.

E9.4.3.2 Erection Methods and Equipment

The Contractor shall submit to the Contract Administrator at least three (3) weeks prior to installation, drawings which shall consist of three (3) sets of prints, one (1) reproducible sepia set and an electronic copy, showing complete details of the method of erection he proposes to follow and the number and character of the equipment he proposes to use. Where practicable, this submission shall be made prior to submission of shop drawings. Erection will not be allowed to proceed without the Contract Administrator's review of the method proposed. The review shall not relieve the Contractor of any responsibility for the safety of the proposed method of erection or of the equipment or from carrying out the Work in full accordance with the Drawings and these Specifications.

Tack welding for the purpose of falsework attachments or any other temporary attachment will not be permitted.

E9.4.3.3 Handling and Storing Materials

The Contractor shall design whatever special handling requirements there may be for transporting and erecting. This design must be submitted with the falsework submission and be designed by a Professional Engineer registered in the Province of Manitoba and employed by the Contractor. The Contractor shall ensure the stability of all components and provide temporary structural steel bracing, when required, during: handling, transportation, and erection and until the structural steel is in its final location with all permanent bracing, connections, and supports in place and when the concrete in the deck has reached 75 percent of its specified strength.

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.

E9.4.3.4 Field Assembly

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.

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.

E9.4.3.5 Straightening Bent Material

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.

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.

E9.4.3.6 Bolting

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.

E9.4.3.7 Splice Connections

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

E9.4.3.8 Misfits

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.

E9.4.3.9 Damage to Substructure

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.

The erection of structural steel shall be done so that there shall be no forces applied to cause overstressing of the piers and abutments.

E9.4.3.10 Welding to Galvanized Metal

All galvanizing should be removed from prepared surfaces to be field welded.

After field welding the metal shall be touched up by the Galvanizing Touch-up Process in accordance with Clause E9.4.3.11 of these Specifications. All Galvalloy repairs shall be made flush with adjacent metal.

E9.4.3.11 Galvanizing Touch-up Procedure

Any areas of damaged galvanizing, and all fields welds, are to receive field-applied galvanizing, in accordance with ASTM A780-00.

E9.5 Quality Control

E9.5.1 Inspection

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.

E9.5.2 Access

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

E9.5.3 Qualifications of Contractor

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

E9.5.4 Qualifications of Operators

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.

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.

E9.5.5 Welding Procedures

The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

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.

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

The use of gas welding will be limited to light structural elements.

E9.5.6 Quality and Details of Welds

The quality and details of welds shall be in accordance with CSA Standard W59-1989, Clause 12.5.4.

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 W59-1989, Clause 12.5.4. Fusion type defects referred to in the Clause shall be interpreted as slag inclusions and similar generally elongated defects.

Undercut at the toe of the flange-to-web fillet weld will not be allowed, except in regions of low stress at the discretion of the Contract Administrator.

E9.5.7 Material Storage and Care

E9.5.7.1 Steel

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.

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

E9.5.7.2 Welding Consumables

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.

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 contaminators.

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.

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.

E9.5.7.3 Testing

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.

A testing agency will work with the Contract Administrator to carry out inspection and testing. The Contractor shall cooperate fully with the testing firm.

The minimum extent and frequency of weld inspection shall be as follows:

Radiographic Inspection:

- 100% of all flange butt welds
- 100% of all web butt welds

Magnetic Particle Inspection

- 50% of web-to-flange welds
- 10% of web-to-stiffener welds
- 100% of stiffener-to-tension flange welds

All welds will be visually inspected.

The inspector shall have access to all of the fabricator's normal quality control records for this Contract specified herein.

Weld inspection will be carried out in accordance with the requirements of CSA Standard W59-1989.

Welds that are found to be inadequate and unsatisfactory shall be repaired in accordance with CSA Standard W59-1989, retested and paid for by the Contractor. All initial testing will be paid for by the City.

No repair shall be made until agreed to by the Contract Administrator.

E9.5.8 Unacceptable Work

Any Work found to be unacceptable shall be corrected in accordance with CSA Standard W59-1989, Clause 5.10.

No repair shall be made until agreed to by the Contract Administrator.

E9.5.9 Method of Measurement

The supply and erection of all structural steel excluding miscellaneous bridge repairs, including all incidental structural steel elements, components and fasteners, will be paid for on a lump sum basis as accepted by the Contract Administrator and no measurement will be made for this Work.

The supply and erection of structural steel for miscellaneous bridge repairs, including all incidental structural steel elements, components and fasteners, will be measured on a mass basis. The mass to be paid for shall be the total number of kilograms of structural steel supplied and erected in accordance with this Specification, as accepted by the Contract Administrator, and as computed from the reviewed shop drawings.

E9.5.10 Basis of Payment

All structural steel excluding miscellaneous bridge repairs, will be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work
Structural Steel Excluding Miscellaneous Bridge Repairs
a) Supply
b) Installation

The supply and installation of structural steel for miscellaneous bridge repairs will be paid for at the Contract Unit Price per kilogram for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work

Structural Steel for Miscellaneous Bridge Repairs

a) Supply
   - (i) Plate ≤ 15 mm thick
   - (ii) Plate > 15 mm thick but ≤ 25 mm thick
   - (iii) Plate > 25 mm thick
   - (iv) Angles ≤ 10 kg/m
   - (v) Angles > 10 kg/m
   - (vi) Channels ≤ 30 kg/m
   - (vii) Channels > 30 kg/m
   - (viii) Rolled W or S Section ≤ 50 kg/m
   - (ix) Rolled W or S Section > 50 kg/m

b) Installation
   - (i) Plate ≤ 15 mm thick
   - (ii) Plate > 15 mm thick but ≤ 25 mm thick
   - (iii) Plate > 25 mm thick
   - (iv) Angles ≤ 10 kg/m
   - (v) Angles > 10 kg/m
   - (vi) Channels ≤ 30 kg/m
   - (vii) Channels > 30 kg/m
   - (viii) Rolled W or S Section ≤ 50 kg/m
   - (ix) Rolled W or S Section > 50 kg/m

E10. SUPPLYING AND PLACING REINFORCING STEEL

E10.1 Description

This Specification shall cover the supply, fabrication, and placement of plain and hot-dipped galvanized reinforcing steel and welded wire mesh.

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.

E10.2 Materials

E10.2.1 General

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

E10.2.2 Handling and Storage of Materials

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

E10.2.3 Reinforcing Steel

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

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.

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.

E10.2.4 Galvanizing

E10.2.4.1 Shop Applied

The galvanizing shall be shop applied and strictly in accordance with ASTM A767M-00a to a retention equal to a Class II level (610 gm/m^2), except as otherwise specified herein.

Submit an original and three (3) copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements.

Preclean reinforcing steel using acceptable methods to produce an acceptable surface for quality hot-dip galvanizing.

Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

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.

Coating adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

Sheared ends of bars shall be coated with a zinc-rich formulation before rusting occurs and before shipment to the job site.

Furthermore, all field welds, as well as cracking and other visible damage or deterioration of the hot-dip galvanizing as a result of handling or bending operations, or any other causes, shall be galvanize-coated with field-applied galvanizing touch-up material as specified hereinafter.

E10.2.4.2 Field Applied

Field applied galvanized coating shall be brush applied:

a) Zinga, as supplied by Pacific Evergreen Industries Ltd., West Vancouver, BC, Canada (604) 926-5564
b) ZRC Cold Galvanizing Compound, as supplied by ZRC Worldwide, 145 Enterprise Drive, Marshfield, MA 02050 USA (781) 319-0400
c) Or equal as acceptable by the Contract Administrator.

All field-applied galvanized coatings shall be applied in accordance with the manufacturer's recommendations and as directed by the Contract Administrator.

The maximum area to be repaired in the field shall be 5,000 mm^2. Any damaged article with a damaged area greater shall be rejected, removed, and replaced at the contractor's expense.

E10.2.5 Bar Accessories

Bar accessories shall be of a type acceptable to the Contract Administrator. They shall be made from a nonrusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

Bar chairs, bolsters, and bar supports shall be cementitious material. No plastic, PVC, or galvanized bar chairs will be used.

Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator.

Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (16 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. Wire for tying galvanized bars shall be annealed wire. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E10.3 Construction Methods

E10.3.1 Fabrication of Reinforcing Steel

E10.3.1.1 General

Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18-M92 to the lengths and shapes as shown on the Drawings.

E10.3.1.2 Submissions

At least twenty-one (21) days prior to the scheduled commencement of any fabrication, the qualifications of the contractor, the qualifications of operators, the shop drawings including bar lists, and the mill certificates shall be submitted to the Contract Administrator for his review.

The shop drawings shall consist of three (3) sets of prints and one (1) reproducible sepia set.

E10.3.1.3 Preparation of Galvanized Reinforcing Steel

The fabricator shall consult with the Contract Administrator 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.

Remove all welding slag, splatter, antisplatter compounds, and burrs prior to delivery for galvanizing.

Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint, and other deleterious material prior to fabrication.

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.

Hooks or bends should be smooth and not sharp. Bars are to be bent prior to galvanizing. They shall be fabricated to a bend diameter equal to or greater than indicated in the following table:

Minimum Finished Bend Diameters	
Bar No.	**Bend Diameters (mm)**
10M	60
15M	90
20M	120
25M	200
30M	240
35M	280

E10.3.2 Placing of Reinforcing Steel

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.

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.

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.

Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.

Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. 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.

Following placement of galvanized-coated bars, all areas of damaged coating shall be repaired using approved touch-up coating material specified in Clause E10.2.4.2.

E10.3.3 Reinforcement System

All reinforcing steel for the piers shall be plain reinforcing steel.

All the remaining reinforcing steel, including, but not limited to, the deck, curbs, sidewalks, approach slab, approach roadway slabs, expansion slab, and the abutments shall be galvanized.

E10.4 Quality Control

E10.4.1 Inspection

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.

E10.4.2 Access

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

E10.4.3 Quality Testing

Quality control testing will be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

E10.5 Method of Measurement

Supplying and Placing Reinforcing Steel will be measured on a mass basis. The mass to be paid for shall be the total number of kilograms of reinforcing steel supplied and placed in accordance with this Specification, as accepted by the Contract Administrator, as computed from the reviewed shop drawings, excluding the mass of bar accessories and the mass of galvanizing.

E10.6 Basis of Payment

Supplying and Placing Reinforcing Steel shall be paid for at the Contract Unit Price per kilogram for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:
Supplying and Placing Reinforcing Steel
a) Plain
b) Galvanized
c) Galvanized welded wire mesh

E11. STRUCTURAL CONCRETE

E11.1 Description

This Specification shall cover the preparation of Portland Cement Concrete for, and all concreting operations related to, the construction of Portland Cement Concrete Works as specified herein.

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.

E11.2 Materials

E11.2.1 General

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

E11.2.2 Handling and Storage of Materials

All materials shall be handled and stored in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-00.

E11.2.3 Testing

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 of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

All materials shall conform to CSA Standard CAN/CSA-A23.1-04.

All testing of materials shall conform to CSA Standard CAN/CSA-A23.2-04.

All materials shall be accepted by the Contract Administrator at least twenty-one (21) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E11.2.4 Aggregates

The Contractor shall furnish in writing to the Contract Administrator the location of the sources where aggregate will be obtained in order that same may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(a) Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam, or other deleterious substances.

The fine aggregate shall be well-graded throughout and shall conform to the grading requirements in Table E11.1.

TABLE E11.1 GRADING REQUIREMENTS FOR FINE AGGREGATE	
Canadian Metric Sieve Size (Mm X 10^{-3})	**Total Passing Sieve Percentage By Weight**
10 000	100%
5 000	95% - 100%
2 500	80% - 100%
1 250	50% - 90%
630	25% - 65%
315	10% - 35%
160	2% - 10%

The fineness modulus of fine aggregate shall not be less than 2.2 nor more than 3.1 unless otherwise approved by the Contract Administrator.

(b) Coarse Aggregate-Standard

Standard coarse aggregate shall be used for the piers and abutments, curbs and sidewalks.

Standard coarse aggregate shall consist of natural gravel, crushed stone, or other accepted materials of similar characteristics, having clean, hard, strong, durable, uncoated particles, free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic, or other deleterious matter. Coarse aggregate shall be well graded throughout and shall conform to the grading requirements shown in Table E11.2.

TABLE E11.2 GRADING REQUIREMENTS FOR COARSE AGGREGATE - STANDARD									
Nominal Size of Aggregate (mm)	**Percent of Total Dry Weight Passing Each Sieve (mm)**								
	56	**40**	**28**	**20**	**14**	**10**	**5**	**2.5**	**1.25**
40 - 5	100	95-100		35-70	-	10-30	0-5	-	-
20 - 5	-	-	100	85-100	60-90	25-60	0-10	0-5	-
14 - 5	-	-	-	100	90-100	45-75	0-15	0-5	-
10 - 2.5	-	-	-	-	100	85-100	10-30	0-10	0-5

(c) Coarse Aggregate - Granite

Crushed granite aggregate shall be used for the approach slab and deck concrete.

Coarse aggregate shall be 100 percent crushed, washed granite, low in quartz, clean and free from alkali, organic, or other deleterious matter, shall have two fractured faces, and shall have an absorption not exceeding 3 percent.

The coarse aggregate granite shall be well graded and shall conform to the grading requirements in Table E11.3.

TABLE E11.3 GRADING REQUIREMENTS FOR COARSE AGGREGATE - GRANITE							
Nominal Size of Aggregate (mm)	**Percent of Total Dry Weight Passing Each Sieve (mm)**						
	28	**20**	**14**	**10**	**5**	**2.5**	**0.80**
20- 5	100	100	-	25-60	0-10	0-5	0-1.5

E11.2.5 Cement

All cement unless hereinafter specifically stated, shall be Type 10 Normal Portland Cement, conforming to requirements of CSA Standard CAN/CSA-A5-98.

The Contractor shall obtain and furnish to the Contract Administrator a statement signed by an officer or chemist of the cement manufacturer, certifying that the cement furnished does not exceed 0.6 percent alkali equivalent, as measured by the percent of sodium oxide plus 0.658 times the percent of potassium oxide.

Tests for determining alkali content shall be carried out in accordance with ASTM Standard C114-00, Standard Method of Chemical Analysis of Hydraulic Cement.

Cement for use in the deck concrete shall be Type 10SF silica fume cement, consisting of 8% silica fume interground or blended with normal Portland Cement, conforming to the requirements of CSA Standard CAN/CSA-A362-98 and CAN/CSA-A23.1-94. The silica fume Portland type 10SF cement shall have a specific surface not exceeding 650 m^2/kg, measured in accordance with ASTM Standard C204-00.

E11.2.6 Fly Ash

Use of fly ash will be permitted for use in Structural Concrete supplied under this Specification, to a maximum of 10% of cement content. The use of fly ash to reduce cement content is not permitted.

E11.2.7 Water

Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances, and in accordance with CSA Standard CAN3-A266.2M. It shall be equal to potable water in physical and chemical properties. The Contractor shall not use water from shallow, stagnant, or marshy sources.

E11.2.8 Admixtures

No admixtures, other than air-entraining agent, water-reducing agent, and superplasticizer, shall be used without the written authorization of the Contract Administrator, unless otherwise specified in these Specifications. It shall be the Contractor's responsibility that any admixture is compatible with all other constituent materials.

(a) Air-Entraining Agent

The air-entraining agent shall conform to the requirements of CSA Standard CAN3-A266.1-M78 and shall produce a satisfactory air-void system and an air content within the ranges specified in C.S.A. Standard CAN/CSA-A23.1-00 for each class of concrete.

(b) Water-Reducing Agent

The water-reducing agent shall be Type WN and shall conform to the requirements of CSA Standard CAN3-A266.2-M78. An approved product is Master Builders' Poly 997 or equal as approved by the Contract Administrator.

(c) Superplasticizing Agent

If the Contract Administrator authorizes the use of a superplasticizing agent, the superplasticizing shall conform to the requirements of CSA Standard CAN3-A266.5 and CAN3-A266.6, but must be compatible with the air-entraining agent and be included in the mix design for approval. The agent shall be free of chlorides and shall not affect the air-entraining agent's ability to produce a satisfactory air-void system. The sequence of batching the superplasticizing agent in with the other constituent materials shall also accompany the approved mix design for approval.

(d) Other Admixtures

No other admixtures will be authorized for use in Portland Cement Concrete, unless authorized in writing by the Contract Administrator.

E11.2.9 Polypropylene Fibres

The polypropylene fibres for the deck concrete only, shall consist of 100% virgin polypropylene as supplied by Grace (Microfibre) or Master Builders (Fibre Mesh MD), or equal as accepted by the Contract Administrator. The minimum dosage rate shall be 1.5 kg/m^3.

E11.2.10 Curing Compound

Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a. Rate of application shall be the rate required to meet the requirements of ASTM C309-98a for the texture of concrete the curing compound is being applied to.

Curing compound for approach slabs and structural sidewalks shall be resin-based and white-pigmented.

E11.2.11 Flexible Joint Sealant

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

E11.2.12 Latex Bonding Agent

Latex bonding agent shall be SCP Concrete Bond, as supplied by Specialty Construction Products, Surfacrete Concentrate by Sternson, or equal as accepted by the Contract Administrator. Polyvinyl acetate-based latexes will not be permitted.

E11.2.13 Form Coating

Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal as accepted by the Contract Administrator.

E11.2.14 Fibre Joint Filler

Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751-99 or equal as accepted by the Contract Administrator.

E11.2.15 Patching Mortar

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 l 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.

E11.2.16 Bonding Grout

The grout for bonding the curb concrete to the fibre-reinforced silica fume concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:

.1 1 part water
.2 1 part latex bonding agent
.3 1½ parts Type 10SF Portland cement

The consistency of the bonding grout shall be such that it can be applied with a standard spray nozzle to the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

For sealing vertical joints between adjacent lanes a modified bonding grout, thinned to paint consistency, shall be used. The modified bonding grout shall consist of 1 part water and 1½ parts Type 10SF Portland cement.

For sealing horizontal joints between deck slab and curbs, a ConSeal CS-231 controlled expansion waterstop sealant, as supplied by specially construction products, or equal as accepted by the Contract Administrator will be required.

E11.2.17 Formwork

Formwork materials shall conform to CSA Standard CAN/CSA-A23.1-00, and American Concrete Publication SP:4, “Formwork for Concrete.”

No "stay-in-place" formwork or falsework is permitted except at the sidewalk. The “stay-in-place” formwork at the bridge sidewalk shall be Vicwest Hi-Bond composite floor HB938 Z275 galvanized with nominal core thickness of 1.22 mm or approved equal.

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.

All other form sheeting shall be Douglas Fir, overlay formline type conforming to CSA Standard O121-M1978. Approved manufacturers are "Evans" and "C-Z".

Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place, must be made from a nonrusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

Forms for exposed surfaces that do not require a formliner may be either new plywood or steel as authorized by the Contract Administrator.

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.

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.

Stay-in-place forms are not acceptable and will not be accepted unless shown on the Drawings.

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.

E11.2.18 Form Liner

Form Liner shall be Dupont-Zemdrain, Type II CPF Liner, or equal as accepted by the Contract Administrator. This Form Liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.

Paper-lined forms shall be used on all soffit surfaces.

E11.2.19 Galvanized Dowels

Dowels shall be fabricated in accordance with CSA Standard CAN/CSA-G30.18-M92.

The dowels shall be galvanized in accordance with CSA Standard G164-M92, to a retention of 600 g/m^2.

E11.2.20 Curing Blankets

Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, curing blankets, white in colour. An approved product is "Mirafi Geotextile P150" or equal as accepted by the Contract Administrator.

E11.2.21 Benchmark

Benchmark plugs as supplied by the City.

E11.2.22 Grout

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

E11.2.23 Dampproofing

Dampproofing materials shall be applied to all buried surfaces in contact with the soil to within 300 mm of Finish Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakeor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator.

Dampproofing materials shall be applied to the sides of the abutment which became buried by landscape Works.

All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.

Primer: Asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable product is Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator.

E11.2.24 Backup Rod

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

E11.2.25 Low Density Styrofoam

Low density styrofoam shall be the type specified on the Drawings or as accepted by the Contract Administrator.

E11.2.26 Precompressed Expanding Filler

Precompressed expanding filler shall conform to ASTM D2628-91. An acceptable product is Delastic E-2500, by The D.S. Brown Company, or equal as accepted by the Contract Administrator.

E11.2.27 Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator.

E11.3 Concrete Design Requirements

E11.3.1 Mix Design Statement

For each type of concrete used, the Contractor shall provide the Contract Administrator with a Mix Design Statement, certifying the constituent materials and mix proportions that will be used in the Portland Cement Concrete. The Contractor shall include, in the certification, the following information:

(a) List the product name and source of all proposed constituent materials of the concrete including cement, coarse aggregate, fine aggregate, water, water-reducing agent, and air entraining admixture. A statement is required indicating that the constituent materials proposed for each mix design are compatible with each other, thereby providing concrete with good long-term durability capabilities.

(b) Supply recent records of each mix design for concrete quality control tests including slump, total air content, and 7 and 28 day compressive strengths. The Contractor shall supply reasonable evidence that the mix designs submitted will produce concrete with the specified strength, workability, and yield.

When previously satisfactory strength data on the proposed mix is not available, the Contract Administrator may require the preparation of field trial batches in order that the concrete be tested prior to construction. Such field trial batches shall be carried out in similar conditions and using similar equipment, batching, and mixing procedures as will be used in the actual construction. The number of

trial batches required shall be determined by the Contract Administrator and shall depend on the class of concrete materials.

(c) Supply recent test information on sieve analysis of fine and coarse aggregates in accordance with Standard Test Method A23-2A. Results should be within acceptable limits specified herein.

(d) Supply recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

(e) Supply recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

(f) Supply recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

(g) Supply recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with Standard Test Method A23.2-16A.

(h) Supply recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-20A.

(i) Supply recent information on tests performed on the interground or blended silica fume Portland cement to be used, including the specific surface.

(j) The Contractor shall submit test data showing that the Contractor's proportioning and mixing equipment, procedures, and concrete mix constituent materials are capable of producing a satisfactory air-void system in the hardened concrete. Prior to site mobilization, the Contractor shall prepare and cast representative test specimens of each type of concrete using the same proportioning and mixing equipment and procedures, and the same concrete admixtures as will be employed for the supply and placement of each type of structural concrete.

As a minimum, the air-void system testing program to be carried out by the Contractor prior to site mobilization must include the following:

i) Date test specimen cast.

ii) Air temperature during casting.

iii) Concrete temperature during placement.

iv) Air content of the plastic concrete as determined in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method".

v) Slump of the plastic concrete as determined in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete".

vi) Total air-void content, specific surface, spacing factor, and air-paste ratio of the air-void system in the hardened concrete, as determined in accordance with CSA Standard Test Method A23.2-17C, "Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete".

vii) Density of the hardened concrete.

viii) Brand and dosage rate of air-entraining and water-reducing admixtures and any other admixtures used in the test specimens.

The test specimen 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.

All testing shall be carried out by a CSA certified concrete testing laboratory.

k) Determine the water soluble chloride ion content of the hardened concrete in accordance with CSA Standard Test Method A23.2-4B prior to the start of construction.

(l) Supply any other information deemed applicable by the Contract Administrator.

The cost for batching, casting, and testing trial batch specimens shall be incidental to the Supply and Placement of Structural Concrete. No measurement or separate payment will be made for this Work.

The Mix Design Statement shall be submitted to the Contract Administrator at least twenty-one (21) days prior to the delivery of any concrete to the job site. Once accepted by the Contract Administrator, all concrete shall be supplied in accordance with this Statement, which shall be called the Job Mix Formula.

No changes in the Job Mix Formula will be permitted without following the above procedure.

E11.3.2 Concrete Strength and Workability

(a) Type 1 - Structural Concrete (all concrete except as specified as Type 2)

Proportioning of fine aggregate, coarse aggregate, cement, water, and air-entraining agent shall be such as to yield concrete having the required strength and workability, as follows:

35 MPa Concrete:

i) Minimum Compressive Strength @ 28 days = 35 Mpa
ii) Maximum Water/Cement Ratio = 0.40
iii) Minimum Cement Content = 365 kg/m^3
iv) Slump = 75 mm $\pm$ 25 mm
v) Coarse Aggregate Maximum Size = 20 mm Nominal
vi) Air Content for both Fresh Concrete and Hardened Concrete = 20 mm Aggregate = 5.0% to 8.0%
vii) Cement = Type 10

The minimum compressive strength of the in-place concrete shall be 20 MPa before it may be subjected to freezing temperatures.

The minimum compressive strength of approach slabs, and approach roadway slabs before opening them to traffic shall be 25 MPa.

(b) Type 2 – High Performance Structural Concrete (for deck slab)

The constituent materials shall be proportioned and combined in accordance with the approved Job Mix Formula, such as to yield a fibre-reinforced silica fume concrete, meeting the following design and performance requirements:

i) 35 MPa minimum compressive strength at 28 days
ii) 20 mm maximum coarse aggregate size
iii) minimum cementitious content (including silica fume) shall be 380 kg/m^3
iv) minimum 1.5 kg polypropylene fibres per cubic metre
v) 6.5 $\pm$1% plastic entrained air content
vi) 0.38 maximum water/cementitious ratio (including silica batch fume)
vii) mix must be workable with a 70 mm +/- 20 mm slump at discharge
viii) temperature of concrete mix at discharge shall not exceed 18°C
ix) slump retention after 45 minutes shall be a minimum of 75% of initial batching slump
x) minimum specific surface, measured in accordance with Ontario Provincial Standard Specification 1350, shall be 25 mm^{-1} in hardened concrete
xi) Permeability: Maximum of 1000 coulombs as a charge passed in a 6-hour test, in accordance with ASTM C1202, on a sample cured for 28 days

The Contractor is also required to achieve a Performance Index, which is based upon the hardened air content and air voids spacing factor, of not less than 80. Hardened air content and air-void spacing factor shall be determined through core samples tested in accordance with ASTM C457, “Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete.” The number and location of tests will be determined by the Contract Administrator in the field.

Notwithstanding CSA Standard A23.1, cores taken from deck concrete must achieve design strength as a minimum.

A failure of the approved Job Mix Formula to produce concrete meeting the above-specified requirements will be grounds for the Contract Administrator to immediately reject the Job Mix Formula, and will necessitate the Contractor to provide the Contract Administrator with an updated Mix Design Statement in accordance with Clause E11.3.1. No further concrete placement will be undertaken until a replacement Job Mix Formula is accepted by the Contract Administrator.

E11.4 Concrete Supply

E11.4.1 General

All structural concrete supplied under this Specification shall be produced using a certified ready-mix concrete plant.

E11.4.2 Ready-Mix Concrete Supply

Unless otherwise specified in these Specifications of the Contract, only the use of a certified ready-mixed concrete plant will be permitted in accordance with Standard Specification CW 3310-R9. Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CSA Standard CAN/CSA-A23.1-00, "Production of Concrete", except that the transporting of ready-mixed concrete in nonagitating equipment is not permitted without the written permission of the Contract Administrator.

Unless otherwise directed by the Contract Administrator, the discharge of ready-mixed concrete shall be completed within 1.5 hours after the introduction of the mixing water to the cement and aggregates.

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

E11.4.3 Deck Slab Concrete

Deck slab concrete shall be batched by a certified ready-mix concrete plant.

E11.5 Equipment

E11.5.1 General

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.

The Contractor shall have sufficient standby equipment available on short notice at all times.

E11.5.2 Placing and Finishing Equipment for Deck Slab Concrete

E11.5.2.1 Placing Equipment

Concrete placing methods and equipment shall be such that the concrete is conveyed and deposited at the specified slump, without segregation, and without changing or affecting the other specified qualities of the concrete. Concrete placing methods and equipment shall also meet minimum production levels as specified herein.

Adjacent exposed deck reinforcing steel shall be adequately protected during concrete placement.

Equipment for conveying concrete, such as buckets, buggies, belt conveyors, etc., shall be of such design, size and condition to ensure a continuous and adequate supply of concrete of the specified mix and slump, without segregation at the point of deposition, or other detrimental impact on the quality of concrete or finishing product.

Pumping of the fibre-reinforced silica fume concrete will not be permitted.

E11.5.2.2 Mechanical Screed

The mechanical screed shall be:

(a) constructed to span the full width of the deck slab being placed

(b) supported on screed rails positioned above the surface being screeded

(c) sufficiently strong (truss type) to retain its shape under all working conditions, especially if any Work scaffolds are supported on the same screed rails

(d) capable of producing the required flatness tolerance as specified in Clause E11.7.6.

(e) capable to raise and to allow reworking of surfaces.

(f) Screed surface touching concrete shall not be made of aluminium (magnesium acceptable) and equipment with a mechanism to properly vibrate the screed.

E11.5.2.3 Movable Work Bridge

At least two moveable Work bridges will be required (one for finishing and one for curing operations), independent of the mechanical screed machine.

These movable Work bridges shall travel guided on rails supported clear of the finished deck.

The Contractor shall install a sturdy walkway with safety railing on each side of the Work area for the purpose of providing access to the Work bridge.

E11.5.2.4 Movable Deck Hoarding

Shop drawings (three [3] prints and one [1] reproducible sepia) showing the fabricated details of the movable deck hoarding shall be provided to the Contract Administrator for review at least twenty-one (21) days prior to the scheduled commencement of fabrication. Such drawings shall show design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.

The movable deck hoarding shall be designed by a Professional Engineer registered in the Province of Manitoba and constructed to the following requirements:

(a) Sufficient clearances shall be provided to enable the placing and finishing of the concrete to proceed unhindered inside the hoarding.

(b) The minimum length of the hoarding shall be 25 m or the length of the structure, whichever is shorter.

(c) The hoarding shall have a clear, unsupported span of at least the clear deck width, plus room for the mechanical screed machine.

(d) The roof and sides of the hoarding shall be covered with waterproof and insulated material, with all joints overlapping and rendered waterproof and not subjected to heat loss. The material shall be strong enough to withstand the force of "driving" rain or snow, and at least two thirds of the roof and the entire sides shall be opaque in order to prevent the deck concrete from being exposed to direct sunlight.

The sides of the hoarding at the junction of the hoarding with the deck forms shall be constructed to prevent the entrance of rain from the sides.

Provisions shall be made for enclosing the ends of the hoarding on short notice in the event that closing of the ends proves necessary during the concrete placing operations.

The roof of the hoarding shall be checked for damage and water tested before each concrete pour, and all repairs shall be made, as required, before concrete placing will be allowed to begin.

(e) The hoarding shall be constructed on wheels or rollers for ready mobility. Another acceptable method is to have stationary sides, with the roof on wheels or rollers.

(f) The rail system for the movable deck hoarding shall be independent of the rail system used for the screeding machine and the Work bridge.

(g) The hoarding shall not be removed from overtop of a newly completed deck slab without first obtaining permission from the Contract Administrator.

The supply, setup, operation and takedown of the movable deck hoarding shall be considered incidental to the placement of the deck slab concrete, and no separate measurement or payment will be made for this Work.

E11.5.2.5Vibrators

The Contractor shall have sufficient numbers of 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. The Contractor shall have standby vibrators available at all times during the pour.

E11.5.2.6 Miscellaneous Equipment

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.

E11.5.3 Placing and Finishing Equipment for Approach Slab

E11.5.3.1 Mechanical Screed

The mechanical screed shall be:

i) constructed to span the full width of the approach slabs and roadway approach slabs being placed

ii) supported on screed rails positioned above the surface being screeded

iii) sufficiently strong to retain its shape under all working conditions, especially if any Work scaffolds are supported on the same screed rails

iv) capable of producing the required flatness tolerance as specified in Clause E11.7.6.

E11.5.3.2 Movable Work Bridge for Structural Approach Slab

The Contractor shall provide a movable bridge, spanning the approach slab at a right angle to the centreline of roadway in order to facilitate the brooming; the application of curing compound; the inspection of the freshly-placed concrete; and any remedial Work required to be done to the screeded surface, including filling in any holes left by the screed bars. After the surface has been screeded, all further Work that may be required shall be done from the Work bridge.

The Contractor shall install a sturdy walkway with safety railing on each side of the Work area, as required, for the purpose of providing safe access to the Work bridge.

E11.5.4 Vibrators

The Contractor shall have sufficient numbers of 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.

The Contractor shall have standby vibrators available at all times during the pour.

E11.5.5 Miscellaneous Equipment

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.

E11.6 Construction Methods

E11.6.1 Scope of Work

It is intended that this Specification cover the construction of the following items, as indicated on the Drawings:

a) West Abutment
b) East Abutment
c) Pier #2
d) Pier #3
e) Pier #4
e) Pier #5
f) Deck Slab
g) Curbs
h) Sidewalk
i) Approach Slab

E11.6.2 Formliner

Form liners shall be used on all exposed superstructure and substructure surfaces, except soffit surfaces, or where a normal form finish is specified.

The supply and use of the plain formliner finish shall be considered incidental to the Works of this Specification, and no additional payment will be made.

The form liner may be used for a maximum of two (2) applications if the Contractor can prove a clean finish can be achieved, as accepted by the Contract Administrator prior to the liner's second use.

E11.6.3 Formwork and Shoring

The Contractor shall submit detailed shop drawings of the proposed falsework and formwork for supplying all concrete components within the Work to the Contract Administrator at least twenty-one (21) days prior to the date for the first concrete to be placed. Falsework must be designed to carry all loads associated with construction of the overhangs, placement of concrete, hoarding, construction live loads and any other loads that may occur. Shop drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator.

Formwork shall be combined, where necessary to maintain the specified tolerance to compensate for anticipated deflectors in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

The formwork and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. Falsework shall be designed according to the requirements of CSA S269.1, "Falsework for Construction Purposes". The shop drawings shall bear the Professional Engineer's seal. Shop drawings submitted without the seal of a

Professional Engineer will be rejected. The submission of such shop drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shorings.

The formwork and shoring for these Works shall be designed, erected, braced, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.3-M92.

As a minimum, the following spacings shall apply, for studding and waling:

20-mm plywood: studding - 400 mm centre to centre (max.)
walers - 760 mm centre to centre (max.)

Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field-applied form coating or a factory-applied liner as accepted by the Contract Administrator.

Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 25 mm in diameter.

All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.

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 which are not shown on the shop drawings without the prior acceptance of the Contract Administrator.

Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.

Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlements during or after concreting. Shores must not be placed on frozen ground.

Brace shores horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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.

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.

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.

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.

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.

Forms shall be sufficiently tight to prevent leakage of grout or cement paste.

Form panels shall be constructed so that the contact edges are kept flush and aligned.

Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after 48 hours for the Contract Administrator to judge the type of surface produced.

Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.

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.

It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:

i) Concrete is to be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface is to be rough with a minimum amplitude of 6 mm and maximum frequency of 15 mm.
ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residue.
iii) Immediately prior to placing new concrete, cement slurry bonding grout shall be applied to the entire surface of the existing concrete.

E11.6.4 Setting Deck Forms

The bridge deck has an allowable tolerance in camber; and it may be necessary to vary the depth of the deck slab over the top flanges, in order to maintain a correct finished grade on the deck.

The Contractor shall adjust forms, maintain uniform slab thickness, and adjust screed heights to plan elevations or to such other elevation as may be set by the Contract Administrator in the field. The screed chairs shall be tack welded to the screed bases at the time that the screeds are adjusted to the required elevations.

Side forms shall be set to the grade and alignment indicated on the Drawings or as set by the Contract Administrator in the field. The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E11.6.5 Setting Deck Joints

The Contractor shall adjust all deck joints to the required elevations and gaps as accepted by the Contract Administrator prior to placement of concrete adjacent thereto. The adjustment shall be done in accordance with the procedures for adjusting of the deck joints as recommended by the manufacturer or as directed by the Contract Administrator.

E11.6.6 Structural Concrete Other Than Deck Slab Concrete

E11.6.6.1 General

The Contract Administrator must be notified at least 24 hours prior to concrete placing so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. Placement without required prior notification will not be allowed.

E11.6.6.2 Placing Structural Concrete

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.

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.

Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.

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.

Form liners shall be cooled immediately prior to placing concrete by spraying with cold water.

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.

Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

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.

All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.

Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. Spare vibrators in good working condition shall be kept on the job site during all placing operations.

Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces.

Before any concrete is placed in the approach slab or bridge deck, the Contractor shall demonstrate to the satisfaction of the Contract Administrator before each pour that all necessary adjustments have been made to provide the required camber, crown, slab thickness, and concrete cover. This demonstration may be carried out be means of an attachment securely fastened to the finisher's strike-off machine and moving the machine and the strike-off across the deck over the reinforcing steel with a minimum 3 mm clearance between the steel and attachment.

E11.6.6.3 Finishing of Concrete Surfaces

E11.6.6.3.1 Type 1 Finish – Exposed Formed Surfaces

Form liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4, and Type 5 finishes.

Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

All surfaces to receive a form liner finish shall be formed using Form Liner.

The surfaces shall be patched as specified under Clause E11.6.6.7 of this Specification. The surface shall be rubbed with a carborundum brick or other abrasive, to achieve a smooth-rubbed finish.

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.

E11.6.6.3.2 Type 2 Finish – Unformed Surfaces

All unformed concrete surfaces except the bearing seats, pier caps, approach slab, and deck slab shall be finished as outlined hereinafter.

Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. The surface shall then be consolidated with hand floats. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

The top surface of the sidewalks 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.

E11.6.6.3.3 Type 3 Finish - Approach Slab

The top of the approach slab shall be finished using a mechanical screed acceptable to the Contract Administrator.

Screed guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

Plans for anchoring support rails shall be submitted to the Contract Administrator for acceptance. The Contract Administrator's written acceptance must be received by the Contractor prior to the installation of any anchorage devices.

The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.

Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.

Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.

After floating, the approach slab shall be given a coarse, transverse scored texture by drawing a steel broom, as accepted by the Contract Administrator, across the surface.

The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screening operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily finished. The Contract Administrator's judgement in this matter will be final and binding on the Contractor. All loads of concrete that exceed the 1.5 hour discharge time limit during the day, while the finishing operations catch up, will be rejected.

E11.6.6.3.4 Type 4 Finish - Bearing Seat Finish

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. These top surfaces shall not be trowelled. All surfaces on which bearing base plates are to be subsequently placed shall be finished to exact elevations and planes shown on the Drawings by grinding if necessary.

E11.6.6.3.5 Type 5 Finish - Surfaces Below Finished Grade

All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with Clause E11.6.6.7 of this Specification.

All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with Clause E11.6.12 of this Specification.

E11.6.6.4 General Curing

Refer to Clause E11.6.8 for cold weather curing requirements and Clause E11.6.9 for hot weather curing requirements.

The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing,.

Freshly finished concrete shall have either a curing compound applied or covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter. Construction joints shall only be covered and kept saturated by means of wet polyester blankets for the curing period.

Curing compounds shall be applied at the rate required by ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.

Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.

Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the bridge deck soffit surfaces.

E11.6.6.5 Curing of Approach Slab

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

Care shall be exercised to ensure that the polyester 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 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.

Water used for wetting the blankets for the first 72 hours shall be a minimum temperature of 40°C when applied to the blankets on the deck. Potable water only shall be used.

Failure to apply wet polyester blankets within 30 minutes after the concrete has been deposited or before the finished surface comes out from under the blankets, shall be cause for rejecting the Work so affected. Concrete in the rejected area shall be removed and replaced at no additional cost to the Owner.

As soon as the concrete can be walked on without damaging the surface, the polyester blankets shall be covered with a layer of 4 mil thick white polyethylene film. Black insulated tarps will not be allowed.

For the approach slab, the surfaces are to receive a wet polyester blanket cure for at least 72 hours. Warm water, as specified, shall be applied, as necessary, to keep the polyester blankets wet for that period. If the wet cure is removed before seven days, curing compound is to be applied.

Following 72 hours, the insulated tarps may be removed and regular water temperatures may be used to continue the curing with polyester blankets in place.

E11.6.6.6 Form Removal

The Contract Administrator must be notified at least 24 hours prior to form removal and give acceptance prior to beginning Work.

All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise accepted by the Contract Administrator or noted otherwise on the Drawings.

The minimum strength of concrete in place for safe removal of soffit forms for horizontal or inclined members as well as vertical forms for piers and abutments shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads. Bridge deck soffit forms shall remain in place to support construction live loads during the placement of curbs as indicated on the Drawings.

Field-cured test specimens representative of the cast-in-place concrete being stripped, will be tested as specified in this Specification to verify the concrete strength.

E11.6.6.7 Patching of Formed Surfaces

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.

All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.

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

All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

Concrete shall be cast against forms which 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 which will impair the texture of concrete surfaces shall not be used.

E11.6.7 Deck Slab Concrete

E11.6.7.1 General

The deck slab shall be constructed using fibre-reinforced silica fume concrete (Type 2) in accordance with the requirements of this Specification.

E11.6.7.2 Surface Preparation

The form surface over which the deck is to be applied, shall be thoroughly cleaned to remove all dirt, or other deleterious material.

Immediately before proceeding with each pour, the form surface shall be inspected for dirt and other deleterious materials that may have been deposited after the completion of cleaning. All such dirt and deleterious material shall be cleaned off in a manner and by procedures satisfactory to the Contract Administrator.

E11.6.7.3 Setting up and Operation of Movable Deck Hoarding

The Contractor will be required to provide a movable deck hoarding in conjunction with all deck placement during all weather conditions.

The movable deck hoarding shall meet the requirements of Clause E11.5.2.4. Prior to placing any deck concrete, the Contractor shall erect the hoarding and shall demonstrate to the satisfaction of the Contract Administrator that the hoarding can be moved along the entire length of deck concrete to be placed.

During deck placement and finishing, the hoarding shall be moved along the bridge deck, keeping pace with the approved finishing machine. The leading edge of the hoarding shall be kept at a distance of at least 10 m in front of the approved mechanical screed machine at all times during concrete placement, and the back edge shall, at all times, cover and protect from direct sunlight any finished concrete that has not yet been covered by wet polyester curing blankets and white polyethylene film. The hoarding shall be long enough to ensure that no uncovered finished concrete extends beyond the back edge of the hoarding or is exposed to direct sunlight.

Following completion of any deck concrete, the hoarding shall remain in place over the freshly-placed concrete until such time as the concrete has set up or as directed by the Contract Administrator.

E11.6.7.4 Mixing of Deck Slab Concrete

The deck slab concrete shall be provided using a certified ready-mix concrete plant.

A water-reducing admixture for improving workability will be required. The admixture must be accepted by the Contract Administrator and shall be used in strict accordance with the manufacturer's instructions.

Unless otherwise specified herein, the slump measured in accordance with AASHTO T119 shall be 70 mm $\pm$ 20 mm.

The slump will be measured after the amount of concrete specified in CSA A23.2 has been discharged, in the case of ready-mix concrete.

E11.6.7.5 Dry Run of Mechanical Screed Machine

The Contractor is responsible for properly setting the screed rails to ensure compliance with the specified longitudinal and transverse deck grades, without creating potential ponding areas or “bird baths.”

Sufficient screed guide rails to provide the required coverage for the entire pour, as approved by the Contract Administrator, shall be set out and adjusted for height the day prior to the pour. The Contract Administrator will then check the deck grades, as follows:

a) That the screed rail system upon which the mechanical screed machine will travel has been placed in the curb areas. Arrangements for positive anchorage of supporting rails shall provide for horizontal and vertical stability.

b) That the mechanical screed machine and guide rails have been adjusted so that the height of the screed above the existing concrete at each point meets the Contract Administrator's requirements. To confirm the Contractor's adjustment of the machine and guide rails, the mechanical screed machine shall be "dry run," and screed clearance measurements taken at each support point, by the Contract Administrator. Resetting of the machine and/or guide rails shall be done by the Contractor as required by the Contract Administrator.

E11.6.7.6 Deck Slab Concrete Trial Section

The Contractor will be required to conduct a fibre-reinforced silica fume concrete trial for his finishing operations using the accepted mechanical screed machine. The trial shall be conducted on a sloped surface similar to the existing maximum slopes and crossfalls on the bridge. It shall be constructed 8.0 m wide by 4.0 m long, by minimum 140 mm depth. This trial may be conducted at a suitable location at the bridge site, if available, or in the Contractor's own yard.

The trial section shall confirm that the Contractor's mechanical screed machine and operations can produce a surface meeting the finish tolerances as hereinafter specified. In the event that the trial section fails to satisfy the specified surface finish tolerances, additional trial sections shall be constructed and tested. No deck concrete shall be placed on the bridge deck until the Contractor produces a trial section that satisfies the specified surface finishing tolerances, unless otherwise accepted by the Contract Administrator. The trial section, once accepted by the Contract Administrator, shall become the minimum standard of acceptance for the flatness of the finish.

The cost for the construction and subsequent removal of the trial section shall be incidental to the supply and placement of deck concrete. No measurement or separate payment will be made for this Work.

E11.6.7.7 Placing Deck Slab Concrete

The Contractor shall take every precaution necessary to secure a smooth-riding bridge deck, within the tolerances indicated in "Flatness Tolerances" in Clause E11.7.6 of this Specification.

Concrete shall be placed so as to avoid segregation of constituent materials. The mechanical screed machine shall provide sufficient vibration to properly compact the mix. Excess vibration which may cause segregation shall be avoided. The concrete shall be internally vibrated into and around the deck reinforcing steel mat in advance of the mechanical screed machine.

The temperature of the concrete shall not be less than 10°C, nor more than 18°C, at the time of placing, and shall be maintained below this maximum temperature by the inclusion of ice in the mix in place of a portion of the mix water, as approved by the Contract Administrator, taking care to maintain the design water/cementitious ratio.

The overall combination of labour and equipment for proportioning, mixing, placing, and finishing new concrete shall be of such minimum capability as to meet the following requirements, except when noted otherwise on the Drawings.

TOTAL CONCRETE AREA PER BRIDGE (Square Metre)	MINIMUM REQUIREMENTS (Cubic Metres/Hour)
0 - 275	1.0
276 - 410	1.5
411 - 550	2.0
Over 550	2.5

The mechanical screed machine shall be so designed that, when concrete is mixed and placed at the specified minimum rate, under normal operating conditions, the elapsed time between depositing the concrete and final screeding shall not exceed 10 minutes. Similarly, the placing equipment and operations shall be such that in no case shall the elapsed time between batching of ready-mix concrete and final screeding exceeds 90 minutes.

Placement of the concrete shall be a continuous operation throughout the pour. In the event of equipment breakdown, such that concrete placement is stopped or delayed for a period of 60 minutes or more, further placement shall be discontinued and may resume only after a period of not less than 12 hours. This restriction does not prohibit continuation of placement provided that a gap is left in the lane or pour strip. The gap shall be sufficient in length for the mechanical screed machine to clear the previously placed concrete. The fill-in section shall be placed after a period of not less than 12 hours. The edge of any discontinued deck concrete shall be sawcut vertically to a depth of 50 mm and then shall be chipped down to expose polypropylene fibres and reinforcing and thoroughly cleaned before placing further deck concrete.

The edge of the initial deck pour shall be bulkheaded at least 150 mm beyond the actual location of the longitudinal joint. Bulkheads shall be at least 10 mm lower than the finished upper lift surface. Prior to placing subsequent sections, the surface course previously placed shall be sawcut to a maximum depth of 50 mm in a straight line for the full length of the longitudinal joint, and the excess deck chipped off carefully so as not to damage reinforcing steel or exposed polypropylene fibres. The exposed vertical edge shall be thoroughly cleaned.

The subsequent course shall match the adjacent previously placed course, and shall not be placed until the course initially placed is at least 72 hours old.

Screed guides shall be placed and fastened in position to ensure finishing of concrete to the required profile. Supporting rails upon which the mechanical screed machine travels shall be placed in the curb area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. Plans for anchoring support rails shall be submitted to the Contract Administrator for acceptance. The Contract Administrator's written acceptance must be received by the Contractor prior to the installation of any anchorage devices.

No longitudinal or transverse joints will be allowed, unless detailed on the Drawings or authorized in writing by the Contract Administrator. Where transverse and longitudinal joints are allowed, the deck concrete previously placed shall be saw-cut to straightedge and vertical edge before the adjacent concrete lift is placed.

The finished bridge deck grades shown on the Drawings are preliminary only and are subject to revision during construction by the Contract Administrator.

The deck shall have a minimum thickness of 150 mm. Actual deck concrete thickness may be greater. This would be to accommodate field adjustments for camber and deflection.

Fresh concrete 75 mm or more in thickness, shall be vibrated internally in addition to the surface screed vibration.

The vibratory screed of the finishing equipment shall be moved slowly and at a uniform rate, such that screeding shall be completed in no more than two passes. The screed vibrators shall not be allowed to run except when screeding is actually in progress. The screeded surface shall not be walked on or otherwise damaged.

Hand-finishing with magnesium floats may be required to produce a tight, uniform surface and to work out all surface undulation to meet the surface tolerance specified in this Specification. The Contractor shall ensure that the concrete surface is not overworked, resulting in excessive lost of air entrainment.

The concrete surface produced behind the mechanical screed machine shall be magnesium floated the minimum amount necessary to ensure that the surface is free from open texturing, plucked aggregate or projecting polypropylene fibres and local projections or depressions.

During the concrete finishing operations, the Contractor shall utilize a 3.05 m (10 ft.) straightedge with a 75 mm (3 inch) semicircular shape, as supplied by Bidwell Inc., and as accepted by the Contract Administrator. It shall be used both for flattening the plastic concrete surface and for checking and verifying the surface flatness before commencing curing of the surface. The entire surface shall be checked and any areas not within the surface flatness tolerances specified under Clause E11.7.6 of this Specification shall be corrected using the straight edge. Care shall be taken to preserve the crown and cross section of the roadway.

After verification that the surface meets acceptable limits and after final floating, the top surface shall be given a broom finish as approved by the Contract Administrator, uniformly across the surface.

Upon completion of the straight-edge checking, final floating and texturing of the pour, the joint with any previous pour (or any transverse joints) shall be sealed by the application of the modified bonding grout.

E11.6.7.8 Curing Deck Slab Concrete

Immediately following finishing of concrete, apply fog misting until the concrete has enough strength to support the placement of the predampened blankets. The misting device shall not be used to apply water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied with the misting device. There should be no standing water.

After the joint painting is completed, the surface shall be promptly covered with a single layer of clean, predampened, lightly damp, polyester curing blanket.

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 to the satisfaction of the Contract Administrator.

The predampened polyester curing blankets shall be a temperature of 20°C, $\pm$5°C, when applied to the deck.

Failure to apply wet polyester curing blankets within 30 minutes after the deck concrete has been deposited or before the finished surface comes out from under the hoarding, shall be caused for rejecting the Works so affected; however, if the concrete is revibrated because of

failure to meet density requirements within initial vibration, this time will be extended by 15 minutes. Concrete in the rejected area shall be removed and replaced at no additional cost to the City of Winnipeg.

It is intended that the surface receive a wet polyester blanket cure for at least seven (7) days. Water shall be applied as necessary to keep the concrete and polyester curing blankets saturated. The Contractor must ensure the concrete and polyester curing blankets are kept saturated with water for the entire seven (7) days.

As soon as the deck concrete can be walked on without damaging the surface, as approved by the Contract Administrator, the polyester curing blankets shall be covered with a layer of 4-mil polyethylene film and a layer of insulated tarps (during cold weather) in order to maintain the concrete temperature of 10°C.

If, in the opinion of the Contract Administrator, curing has not been maintained sufficiently, the currying period will be extending as directed with no additional payment made.

E11.6.7.9 Limitation of Operations

No concrete shall be placed unless the air and deck temperatures are above 5° and rising. If at an ambient temperature of 25° or above, hot-weather concreting requirements, in accordance with Clause E11.6.9 shall apply.

No concrete placement shall occur at ambient temperature above 32°C.

During hot weather conditions when temperatures greater than 25°C are expected, deck concrete placement shall commence after the sun begins to set and should be completed by 10 a.m.

Lighting will only be permitted for the purposes of placement of deck concrete with provision of adequate lighting installed by the Contractor.

No traffic shall be permitted on a finished surface until after the first 48 hours of the curing period. In addition, no preparation Work shall be performed in the adjacent lane or areas adjoining new concrete during the specified curing period. At temperatures below 12°, the Contract Administrator may require a longer waiting time.

If loading equipment is used, their speed shall be limited to minimized vibration of the superstructure.

E11.6.8 Cold Weather Concreting

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° during placing or curing.

The Contract Administrator will advise the Contractor, in writing, as to the degree of heating of water and aggregates.

Supplementary equipment as required below shall be at the job site if concrete is likely to be placed in cold weather.

Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.

Concrete footings shall not be placed on frozen soil or soil which has frozen and thawed. Other concrete members may be placed on subgrades which have been thawed with prior permission from the Contract Administrator.

The temperature of the concrete shall be maintained at not less than 10°C for 7 days or 15°C for 5 days or 20°C for 3 days after placing. The concrete shall be kept above freezing temperature for at least a period of 7 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 as determined from compressive strength tests on specimens cured under the same conditions as the concrete Works in question.

Aggregates shall be heated to a temperature of not less than 20°C and not more than 65°C. Water shall be heated to a temperature between 55°C and 65°C. The temperature of the concrete at the time of placing in the forms shall be within the range specified in CSA Standard CAN/CSA-A23.1-00 for the thickness of the section being placed.

When the mean daily temperature may fall below 5°C, a complete housing of the Work, together with supplementary heat, shall be provided.

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.

When the ambient temperature is below -15°C, the housing shall be constructed so as to allow the concrete to be placed without the housing having to be opened. If the mixing is done outside of the housing, the concrete shall be placed by means of hoppers installed through the housing. The hoppers are to be plugged when not in use.

When the ambient temperature is equal to or above -15°C, the Contractor will be permitted to open small portions of the housing for a limited time to facilitate the placing of the concrete.

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 housing to the specified 20°C at least 12 hours prior to the start of the concrete placing.

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.

Sufficient standby heating equipment must be available to allow for any sudden drop in outside temperatures and any breakdowns which may occur in the equipment.

Combustion-type heaters may be used if their exhaust gases are vented outside the enclosure and not allowed to come into contact with concrete surfaces. Fire extinguishers must be readily at hand whenever combustion-type heaters are used.

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, temperatures above and below the concrete within the enclosure, temperatures of 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 all times, and shall be turned over to the Contract Administrator at the end of concreting operations.

E11.6.9 Hot Weather Concreting

E11.6.9.1 General

The requirements of this section shall be applied during hot weather, i.e., air temperatures above 25°C during placing.

Concrete shall be placed at as low a temperature as possible, preferably below 15°C but not above 27°C. Aggregate stockpiles may be cooled by water sprays and sun shades.

The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water, providing it has melted by the time mixing is completed.

Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.

Sun shades and wind breaks shall be used as required during placing and finishing.

Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water-reducing agents to maintain workability and strength, and these must then appear in the Mix Design Statement submitted to the Contract Administrator.

Curing shall follow immediately after the finishing operation.

E11.6.9.2 Hot-Weather Curing

When the air temperature is at or above 25ºC, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Fog misting is mandatory for deck concrete at all temperatures.

Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20ºC, in order to minimize the temperature rise of the concrete.

E11.6.9.3 Job Preparation

When the air temperature is at or above 25ºC, or when there is probability of its rising to 25ºC 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 Clause E11.6.9.5.1, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation.

E11.6.9.4 Concrete Temperature

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 1 1.2	 10 5	 27 25

E11.6.9.5 Protection From Drying

Placement of deck concrete will not be permitted when the surface moisture evaporation exceeds 0.75 kg/m^2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.

E11.6.9.5.1 Surface Moisture Evaporation Rate

The nomograph, Figure D1, Appendix D of CSA Standard CAN/CSA-A23.1-04 shall be used to estimate surface moisture evaporation rates.

E11.6.10 Construction Joints

Construction joints shall be located only where shown on the Drawings or as otherwise accepted in writing by the Contract Administrator. Construction joints shall be at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

The face of joints shall be cleaned of all laitance and dirt, after which an epoxy adhesive bonding agent shall be applied. Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

Prior to applying the bonding agent, the joints shall be thoroughly cleaned to make them free of all laitance, loose aggregates, form release agents, curing compound, and other surface treatments, roughened to provide minimum amplitude of 5 mm, and primed with material as recommended by the bonding agent manufacturer. No primer or sealant shall be installed until the joint preparation has been accepted by the Contract Administrator. Accepted means of roughening include the removal of laitence and mortar paste by water jet and soft brush when concrete is in hardened state.

E11.6.11 Installation of Fibre Joint Filler/Neoprene Compression Seal

Prior to installing the filler or compression seal, the joint sides to which the filler or compression seal is to bond shall be thoroughly cleaned of all laitance including form release agents.

Manufacturer's instructions for installation are to be followed. If ambient temperatures are below minimum recommended installation temperatures, artificial heat shall be applied accordingly.

E11.6.12 Application of Dampproofing

Surfaces shall be patched as specified under Clause E11.6.6.7 of this Specification prior to application of dampproofing.

Brush or spray primer on all surfaces, brushing into all corners and allow to dry. Apply two (2) coats of dampproofing allowing the first coat to dry before applying the second coat. Minimum application rate per coat shall be 0.6 litres per square metre.

E11.6.13 Benchmarks

a) The Contractor shall install a benchmark plug(s) supplied by the City at the locations on each structural item shown on the Drawings, and at any other locations as may be directed by the Contract Administrator.

b) The Contractor shall indent into the exposed concrete a structure identification date at the location on each end of the structure as shown on the Drawings in

accordance with the detail shown on the Drawings or as otherwise directed by the Contract Administrator.

E11.6.14 Installation of Electrical Conduit

The Contractor shall supply and install the electrical conduits as described in Specification E20, "Electrical." The conduit shall be held securely in place so as not to become displaced during concrete placement operations. Conduit placement operations shall be performed so as not to damage the conduit.

The contractor shall coordinate the installation of the supplied service boxes with their suppliers, as described in Specification E20, "Electrical". The service boxes shall be held securely in place so as not to become displaced during concrete placement operations. Service box placement operations shall be performed so as not to damage the service boxes.

E11.7 Quality Control

E11.7.1 Inspection

The Contractor shall supply and install the electrical conduits as described in Specification E20, "Electrical". The conduit shall be held securely in place so as not to become displaced during concrete placement operations. Conduit placement operations shall be performed so as not to damage the conduit.

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.

E11.7.2 Access

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.

E11.7.3 Materials

All materials supplied under this Specification shall be subject to testing and acceptance by the Contract Administrator in accordance with Clause E11.2.3 of this Specification.

E11.7.4 Concrete Quality

Quality control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

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.

The frequency and number of concrete quality control tests shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1-04.

An outline of the quality tests is as follows:

Slump tests shall be made in accordance with CSA Standard Test Method CSA-A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits specified in Clause E11.3.2 of this Specification, a second test shall be made.

In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

Air content determinations shall be made in accordance with CSA Standard Test Method CSA-A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits specified in Clause E11.3.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method CSA-A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with he 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.

Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C, "Sampling Plastic Concrete".

Test specimens shall be made and cured in accordance with CSA Standard Test Method CSA-A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".

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 CSA-A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

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 E11.3.2 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 CSA-A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

Notwithstanding CSA A23.2, cores taken from deck must achieve the concrete design strength as a minimum.

E11.7.5 Corrective Action

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

E11.7.6 Surface Flatness Requirements

The surface of the deck concrete (fibre-reinforced silica fume concrete) and the approach slab shall be finished to a flatness tolerance as specified herein. The surface flatness of the finished concrete will be determined by measuring the elevation difference between equidistant points spaced 305 mm apart, along straight or curved lines running parallel or perpendicular (radial) to the direction of travel on the bridge deck. An acceptable surface flatness, as measured along any such line on the finished surface, will have the absolute difference between any two consecutive readings (a reading being the difference in elevation between two consecutive points) not exceeding 5 mm.

At each location(s) where the absolute difference of 5 mm is exceeded, further detailed contour survey(s) will be conducted by and at the discretion of the Contract Administrator to determine the extent of the area requiring corrective action, all at the Contractor's expense. Corrective measures shall involve immediate removal of the surface in the areas not meeting the specified surface flatness tolerance and/or acceptable rideability, in the judgement of the Contract Administrator, and replacement of same to a minimum depth of 50 mm, with the perimeter of the area saw-cut to a depth of 25 mm (the cut face to be sloped to key-in the replacement concrete), as directed by the Contract Administrator. If more than 20 percent of the surface is rejected by the Contract Administrator based on the flatness tolerance and/or any other defect, the Contractor shall immediately remove and replace the entire area of the applicable pour.

This criteria will not apply across the crown or at any deck drains, which must be constructed to meet design grades as shown on the Drawings or as directed by the Contract Administrator.

The Contract Administrator will take readings and determine the acceptability for the surface flatness within thirty-six (36) hours after completion of each pour. The Contractor shall remove and replace the curing blankets, as required by the Contract Administrator, to undertake the necessary flatness testing and shall restore same immediately upon completion of the testing in each area to the satisfaction of the Contract Administrator.

E11.8 Surface Texturing Bridge Deck

Grooves shall be cut into the new concrete deck surface following the curing period. Grooving fresh concrete with a rack in place of cutting cured concrete will not be permitted.

Grooves to be parallel (within 2mm) and cut perpendicular to traffic flow.

Saw cuts to be 2. 5mm wide, 6 +/-2 mm deep and spaced 25 mm on centre.

The area 600 mm from traffic barriers and curbs is not to be grooved and the end of the grooves shall be in a straight line parallel with the traffic barrier or curb face. Adjustment shall be made as directed to accommodate deck drains.

Saw cuts shall extend to within 100 mm of expansion joints and deck drains.

The Contractor will supply all water.

All run-off from grooving operations and suspended solids shall be collected at either end of the bridge off the bridge approaches or deck, in collection tanks, passed through several settling and filtration processes before it is discharged into the sewer system. The final effluent shall meet the requirements of local/provincial standards for water quality.

E11.9 Method of Measurement

E11.9.1 Structural Concrete

The Supply and Placement of Structural Concrete will be paid for on a lump sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

Supply and installation of all the listed materials, concrete design requirements, equipment, construction methods, and quality controls associated with this Specification and Drawings will be considered incidental to the supply and placement of structural concrete, unless noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E11.9.2 Surface Texturing

Surface texturing of bridge deck will be paid for on a lump sum basis, as accepted by The Contract Administrator, and no measurement will be made for this Work.

Supply of equipment, construction methods, and quality controls associated with this Work will be considered incidental, unless noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E11.10 Basis of Payment

E11.10.1 Structural Concrete

The Supply and Placement of Structural Concrete will be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, 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.

Items of Work:

Structural Concrete

a) West Abutment
b) East Abutment
c) Pier #2
d) Pier #3
e) Pier #4
f) Pier #5
g) Deck Slab
h) Curbs and Sidewalks
i) Approach Slab

E11.10.2 Surface Texturing

Surface texturing of bridge deck will be paid for at the Contract Lump Sum Price for the "Item of Work" listed here below, measured as specified herein, 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

Item of Work
Surface Texturing

E12. BRIDGE DECK DRAINS

E12.1 Description

This Specification shall cover supply, fabrication, transportation, handling and installation of bridge deck drains.

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

E12.2 Materials

E12.2.1 General

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

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.

E12.2.2 Hot-Dip Galvanizing

All items supplied under this Specification shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a retention of 600 gm/m^2.

E12.2.3 Deck Drains

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.

E12.2.4 Galvanizing Touch-up

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.

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".

E12.2.5 Welding Consumables

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:

(a) 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.

(b) 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.

(c) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew-point of $-46^{o}C$.

(d) 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.

(e) 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.

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

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.

E12.3 Equipment

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

E12.4 Construction Methods

E12.4.1 Scope of Work

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.

E12.4.2 Fabrication

E12.4.2.1 General

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.

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.

No fabrication or welding of steelwork shall commence until permission to do so has been received form the Contract Administrator.

The repair of any members damaged during fabrication shall be approved by the Contract Administrator.

E12.4.2.2 Preparation of Material

(a) Straightening Material

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

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

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.

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

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.

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.

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)

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.

Sheared edges of plates more than 16 mm in thickness shall be planed to a depth of 6 mm.

Any flame cutting of steel shall be in accordance with Clause E12.4.2.2(c).

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.

E12.4.2.3 Butt Joints

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..

E12.4.2.4 Assembly and Welding Sequences

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

E12.4.2.5 Marking

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

E12.4.2.6 Assembly

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.

Tack welding shall be done by qualified operators, using the smallest size weld required to hold the components of the assembly together. Tack welds shall not be less than 50 mm in length and shall be incorporated in the final weld.

Tack welds shall be made with 4 mm maximum size electrodes and shall be subject to the pre-heat requirements of Clause E12.4.2.7.

E12.4.2.7 Preheat and Interpass Temperatures.

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.

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.

Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.

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
38 mm to 64 mm	107°C
Over 64 mm	150°C

Preheat temperatures above the minimum shown in Table 1 may be required for highly restrained joints if designated by the Contract Administrator.

Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.

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.

E12.4.2.8 Welding

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.

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.

Where the submerged arc or gas metal arc processes are to be used, the Contract Administrator may order that:

A preliminary test run of the approved procedure be made over the length of the joint to prove that the disposition of the equipment, the handling of hoses, and the method and accuracy of travel are satisfactory.

Each operator make a weld specimen not less than 1.2 m in length for fillet welds and 150 mm in length for butt welds. Steel of the same specification and thickness as that to be used in the Work shall be used in the specimen welds. No welding shall be done until such a specimen is satisfactory to the Contract Administrator.

Butt welds shall be extended beyond the edges of the parts to be joined by means of start and run-off tabs providing sufficient thickness to avoid the weld burning through and with a joint preparation similar to that on the main material. For manual shielded metal arc-welding, the width of the tabs shall be not less than the thickness of the thicker part being joined or 75 mm whichever is greater. For submerged arc-welding, the width of the tabs shall be not less than 75 mm. Each weld pass shall be carried far enough beyond the edge of the parts being joined to ensure sound welds in the joint. Tabs shall be removed upon completion and cooling of the weld without damage to the parent plate and the end of the weld made smooth and flush with the edges of the abutting parts.

In gas metal arc-welding, the equipment shall be capable of sustaining a gas flow rate of from 0.85 to 1.27 m^3 per hour (30 to 45 C.F.H.).

E12.4.2.9 Bent Plates

When bending plates, the plates shall be so taken from the stock plates that the bend line will be at right angles to the direction of rolling. The radius of the bend measured inside, shall be not less than the thickness of the plate.

Before bending, the corners of the plate shall be rounded to a radius of 2 mm throughout that portion of the plate at which bending is to occur.

E12.4.2.10 Shop Assembly

Holes shall be sub-punched and, unless otherwise specified, reamed while assembled in the shop. The assembly, including camber, alignment, and accuracy of holes shall be approved by the Contract Administrator before reaming is recommended.

E12.4.2.11 Shipping

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.

E12.4.2.12 Hot-Dip Galvanizing

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/m^2 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.

E12.4.2.13 Handling and Storing Materials

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.

E12.4.2.14 Straightening Bent Material

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.

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.

E12.4.2.15 Welding to Galvanized Metal

All field welding to galvanized metal shall be touched up by the Galvalloy Process in accordance with Clause E12.4.3.2 of these Specifications. All Galvalloy repairs shall be made flush with adjacent metal.

E12.4.3 Installation

E12.4.3.1 Installation of Deck Drains

The deck drains shall be installed at the locations and according to the details shown on the Drawings.

The drain pipes shall be installed so that the pipes are vertical or angled as shown on the Drawings.

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.

Adjustments to adjacent reinforcement bars shall be made as required to provide for proper location and placement of the deck drains.

E12.4.3.2 Galvanizing Touch-up Procedure

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

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.

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".

E12.5 Quality Control

E12.5.1 Inspection

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.

E12.5.2 Access

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

E12.5.3 Qualifications of Contractor

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.

E12.5.4 Qualifications of Operators

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.

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.

E12.5.5 Welding Procedures

The Contractor shall submit copies of the welding procedures which he intends to use, for examination and approval by the Contract Administrator.

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.

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.

The use of gas welding will be limited to light structural elements.

E12.5.6 Quality and Details of Welds

The quality and details of welds shall be in accordance with A.W.S. D1.1, Subsection 9.25.

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.

E12.5.7 Material Storage and Care

E12.5.7.1 Steel

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.

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

E12.5.7.2 Welding Consumables

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.

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.

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.

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.

E12.5.8 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.

All welds will be visually inspected.

The Inspector shall have access to all the Fabricator's normal quality control records for this Contract and not specified herein.

Weld inspection will be carried out in accordance with the requirements of A.W.S. D1.1.

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.

No repair shall be made until agreed to by the Contract Administrator.

E12.5.9 Unacceptable Work

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.

No repair shall be made until agreed to by the Contract Administrator.

E12.6 Method of Measurement

The supply, fabrication, transportation, handling and installation of the deck drains will be measured on a Unit Basis. The number of deck drains to be paid for shall be the total number of deck drains fabricated, transported and installed in accordance with this Specification and accepted by the Contract Administrator.

E12.7 Basis of Payment

The supply, fabrication, transportation, handling and installation of the deck drains will be paid for at the Contract Unit Price for the "Items of Work" listed herebelow, 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.

Items of Work:

Deck Drains
a) Supply
b) Installation

E13. EXPANSION JOINTS

E13.1 Description

This Specification shall cover the supply and installation of expansion joints, as specified herein.

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.

E13.2 Materials

E13.2.1 General

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

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

E13.2.2 Epoxy Adhesive

Epoxy adhesive shall be ST 431, Dural Duralbond, Copper Capbound E, Sikadur 32 Hi-bond, Concresive 1001 LPL, or equal as accepted by the Contract Administrator.

E13.2.3 Epoxy Adhesive Strip

Epoxy adhesive strip shall be 50 mm wide Flex-Tred nonslip adhesive strip or equal as accepted by the Contract Administrator.

E13.2.4 Epoxy Grout

Epoxy grout shall be Duralcrete as distributed by Specialty Construction Products, Dural 103 Gel, or equal as accepted by the Contract Administrator.

E13.2.5 Grout

Grout shall be nonmetallic and nonshrink grout. Acceptable grouts are: Master Builders Set Nonshrink Grout, Sika Grout 212, Sternson M-Bed Standard Grout, CPD Nonhrink Grout, or equal as accepted by the Contract Administrator.

E13.2.6 Expansion Joints

Expansion joints shall be modular expansion joints.

The modular expansion joints shall be a Box Seal Modular Joint System, as specified in the Drawings, and supplied by D.S. Brown, Goodco, or Watson Bowman Acme Corp., or equal as accepted by the Contract Administrator.

Modular expansion joints shall have fabricated cover plates and slider plates as shown on the Drawings.

The seals at each joint shall be made out of neoprene, as accepted by the Contract Administrator and shall be supplied in one continuous piece, separate from the steel extrusions or joint. No shop or field splicing will be allowed in the seals.

All fasteners and hardware of the modular bridge deck expansion joints shall be Grade 316, stainless steel.

E13.2.7 Steel

Steel supplied for the fabrication of the bridge deck expansion joints shall conform to CSA Standard CAN/CSA-G40.21-98, Grade 300W, or equal as accepted by the Contract Administrator. They shall be galvanized after shop fabrication in accordance with CSA Standard CAN/CSA-G164-M92 to a minimum net retention of 600 gm/m^2.

E13.2.8 Steel Extrusions

Steel for the extrusions shall conform to CSA Standard CAN/CSA-G40.21-98, Grade 230G minimum.

E13.2.9 Deformed Bar Anchors

Deformed bar anchors shall conform to the requirements of ASTM Specification A496 and shall be hot dip galvanized.

E13.2.10 Miscellaneous Steel Items

Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to CSA Standard CAN/CSA-G40.21-98, Grade 300W and shall be galvanized in accordance with CSA Standard CAN/CSA-G164-M92 to a minimum net retention of 600 gm/m^2.

E13.2.11 Galvalloy

Galvalloy shall be as supplied by Metalloy Products Company, P.O. Box #3093, Terminal Annex, Los Angeles, California. Locally, this is available from Welders supplies Ltd., 25 McPhillips Street.

E13.2.12 Welding

Welding shall be of a low oxygen classification. Manual electrodes shall be E48016 or E48018. All welding shall be in accordance with CSA Standard W59-M1989.

E13.2.13 Preformed Neoprene Joint Seals

E13.2.13.1 General

Preformed joint box seal shall be manufactured from a vulcanized elastomeric compound using crystallization resistant polychoroprene (neoprene) as the only polymer.

The preformed neoprene joint seal shall meet the requirements of Ontario Provincial Standard Specification (OPSS) 1210 "Material Specification for Preformed Neoprene Joint Seals", latest edition, and as amended herein; and of Table 1 of this Specification. All tests will be made on specimens prepared from the extruded seals.

Table 1
Properties of Elastomeric Gland

Physical Properties	ASTM Test Method	Requirements
Tensile Strength	D412	2000 psi
Elongation @ break	D412	250% min.
Hardness Type A Durometer	D2240 modified	55 +/- 5 points
Oven Aging 70 hrs @ 212 F Tensile Strength Elongation Hardness	D573	 20% loss max. 20% loss max. 0 to +10 points
Oil Swell, 70 hrs @ 212F Weight Change	D471	45%
Ozone Resistance, 70 hrs @ 104F 20% strain, 300 pphm in air	D1149 modified	no cracks
Low Temperature Stiffening 7 days @ 14F Hardness (Type A durometer)	D2240	0 to +15 points
Compression Set, 70 hrs @ 212F	D395 method B modified	40%

E13.3 Equipment

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

E13.4 Fabrication

Shop drawings consisting of three (3) prints and one (1) reproducible sepia showing the fabrication details and proposed field splice details of the steel components of the bridge deck expansion joints shall be provided to the Contract Administrator for acceptance at least twenty-one (21) days prior to scheduled commencement of fabrication. No fabrication shall commence until acceptance of the shop drawings from the Contract Administrator has been obtained. The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall be responsible for the joint installation procedure.

Care shall be taken to ensure that all members are straight and flat and free from twists, bends, and distortions due to welding. The units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall, as well as accurate positioning and alignment of supporting rods. The Contractor shall exercise care in the handling of all units to prevent twists, bends, and warping.

Matching expansion joints shall be assembled and bolted together for shipping.

Expansion joint assemblies shall be shop checked for fit and match marked.

All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint, and other foreign material by commercial sand, grit or shop blasting, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.

<u>In no case shall weldments be substituted for extrusion shapes.</u>

E13.5 Construction Methods

E13.5.1 Installation

The Contractor shall install expansion joints as shown on the Contract Drawings and shall be responsible for the correct matching and seating of parts. The expansion joints shall be checked for accurate matching of sliding plates with the bridge deck expansion joints installed at the specified crossfalls.

E13.5.2 Galvanizing Touch-up Prior to Placement of Concrete

Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.

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.

The process is to be repeated as required to achieve a thickness comparable to original galvanizing.

E13.5.3 Placement of Concrete at Expansion Joints

The assemblies shall be set in position such that they will remain true to line and elevation during and after concreting.

Care shall be taken during compaction of the concrete to ensure that there are no voids in the concrete under and around the structural steel components.

Before concreting, the expansion joint opening shall be set to give the correct width for the mean concrete temperature of the deck. The width shall be obtained from the installation temperature table given on the accepted shop drawings.

Immediately prior to placement of concrete at the expansion joints, all metal contact surfaces between the expansion joint and concrete shall be coated with epoxy adhesive.

Epoxy grout shall be used to fill any bolt holes left after the removal of manufacturer's clamping channels.

E13.5.4 Installation of Seal

The seal at each expansion joint unit shall be installed as one continuous piece after completion of all concreting operations, to the satisfaction of the Contract Administrator, and shall **not** be installed prior to casting of the expansion joints into the concrete.

E13.5.5 Watertight Verification of Joint Seal

Prior to installing the expansion joint and walkway cover plates, the Contractor shall dyke off the bridge deck expansion joints and maintain a minimum of 75 mm of water over all areas of the seal for a period of not less than four (4) hours, with no leakage. Any and all leaks shall be corrected, using mechanical or other adjustment of the bridge deck expansion joints to the satisfaction of the Contract Administrator. In no case shall caulk or other temporary devices or

materials be used to seal leaks in the expansion joints. The Contract Administrator's decision in this regard shall be final.

Prior to commencing the test, the Contractor shall remove all expansion joints forming materials and debris from the deck and from the substructure units below. The Contractor shall provide safe access, acceptable to the Contract Administrator, to the pier tops for inspection of the expansion joints during the testing.

E13.6 Fabrication Guarantee

Before final acceptance of the expansion joints by the Contract Administrator, the bridge deck expansion joints supplier shall provide the City with a written guarantee stating that they will perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the issuance of the Certificate of Acceptance, provided that the expansion joints have been properly installed. The supplier shall state that they have reviewed the installation procedures and find them in accordance with their recommendations. The supplier shall guarantee the replacement of the expansion joints, including removal of the defective expansion joints assembly and supply and installation of the replacement expansion joint, at no cost to the City, in the event that the joint does not perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the issuance of the Certificate of Acceptance.

E13.7 Installation Guarantee

The General Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication guarantee.

Similar to the expansion joint supplier, and before final acceptance by the Contract Administrator, the General Contractor shall guarantee, in writing, the performance of the expansion joints for a period of five (5) years from the date of issuance of the Certificate of Acceptance. Provide in the guarantee for the replacement of the expansion joints at no cost to the City, including all direct and indirect costs in the event that the expansion joints do not perform satisfactorily in the range of design movement and under the design loads for a period of five (5) years from the date of issuance of the Certificate of Acceptance.

E13.8 Quality Control

E13.8.1 General

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

E13.8.2 Markings

All joint seals shall be identified as to the manufacturer by means of a continuous permanent mould mark. The mould marks shall be registered with the Contract Administrator and shall be used on all seals produced by the respective manufacturer. The seal shall also be permanently marked, on the side of the seal, with the date of production and the batch/lot, at intervals of not more than 1.2 m.

The Contractor shall supply to the Contract Administrator a summary of the seals identifying the data of manufacture, the batch/lot, and the proposed installation location.

E13.8.3 Samples and Testing Procedures

The Contractor shall supply sample material at no charge to the City of Winnipeg for quality control testing purposes. The samples will each be 1.0 m long. Each sample will represent not more than three expansion joint seals of the same size, lot, and make and shall be continuous with same until sampled by the Contract Administrator. As soon as the seals to be used in the joint assemblies have been manufactured, they shall be available to the Contract Administrator for sampling.

Testing procedures will be in accordance with the latest revisions of the methods indicated on Table 1.

All materials failing to meet the Specification requirements will be rejected.

Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

E13.9 Method of Measurement

The Supply and Installation of Expansion Joints will be paid for on a lump sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

The supply and placement of concrete associated with the expansion joints will be considered incidental within E11, "Structural Concrete," and no measurement will be made for this Work.

The supply and placement of the concrete associated with the expansion joints concrete shall be undertaken, completed, and paid for in accordance with the requirements of Specification E11, “Structural Concrete.”

E13.10 Basis of Payment

The Supply and Installation of Expansion Joints will be paid for at the Contract Lump Sum Price for the "Items of Work" listed herebelow, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:

Expansion Joints
a) West Abutment
b) Pier #2
c) Pier #4
d) Pier #5
e) East Abutment

E14. BRIDGE BEARINGS

E14.1 Description

This Specification shall cover the supply and installation of bridge bearings at West Abutment, Pier #2, Pier #4, Pier #5 and East Abutment.

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.

E14.2 Materials

E14.2.1 General

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

E14.2.2 Bearings

The bridge bearings, complete with steel plates where shown on the Drawings, anchor pins, anchor bolts, fasteners, and incidental components, shall be supplied by the Contractor to the details and at the locations as shown on the Drawings or as otherwise directed by the Contract Administrator.

The bearings shall conform to the requirements of AASHTO – LRFD Bridge Design Specifications 2000 – 2nd Edition including AASHTO Interim Bridge Specifications.

Bearing types shall be as follows, or equal as approved by the Engineer.

Elastomeric Pads
- Fixed bearings on Pier #2 (west), Pier #4 (east) and Pier #5 (east).
- Expansion bearings on West abutment, Pier #2 (east), Pier #4 (west), Pier #5 (west), and East abutment
- all steel - reinforced elastomeric bearing pads in accordance with the details as shown on the Drawings.

Bearings shall be fabricated from new and unused materials. Reclaimed material is not acceptable.

All bearings shall be clearly coded by the manufacturer. The coding shall prevent mix-up and remain clearly visible on the bearings. They shall also be marked with their position on-site and direction of installation which shall correspond with the information contained on the approved Drawings for the bearings.

Completed bearings shall have the supplier's name (or trade mark) and a serial number indelibly marked thereon. The serial number shall be unique and such as to enable other bearings manufactured at the same time to be traced through the production control records should the need arise. Where practical the serial number shall also be visible after installation of the bearings in the structure. The top of each bearing shall be clearly marked and the size and direction or preset, if any, and the direction of installation shall be indicated.

Provide suitable devices as required for handling, transport, storage and installation of the bearings.

E14.2.3 Elastomer

The elastomer for the elastomeric pads shall be hardness (Shore "A") 55 $\pm$ 5.

E14.2.4 Steel Plates and Bars

Steel plates and bars where shown on the Drawings shall conform to the requirements of CSA Specification G40.21-98 Grade 300W and shall be galvanized after fabrication in accordance with CSA G164-M92 for a minimum retention of 600 g/m^2.

E14.2.5 Bolts, Fasteners, Washer and Nuts

Bolts, nuts and washers required for the bearing installation shall conform to the requirements of ASTM Specification A325. Nuts shall conform to the requirements of ASTM Specification A563, Grade C. Washers shall conform to the requirements of ASTM Specification F436, Type 1. Bolts, fasteners, washers and nuts shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a minimum net retention of 600 g/m^2.

E14.2.6 Anchor Bolts

Anchor bolts where shown on the Drawings shall conform to the requirements of ASTM Specification A325 and shall be galvanized in accordance with CSA G164-M92 for a minimum retention of 600 g/m^2.

E14.2.7 Welding Consumables

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:

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

All electrodes for the manual, shielded metal-arc welding process shall conform to CSA W48.1-M1991, CSA W48.3-93 classification E480XX or imperial equivalent.

(b) 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 ER480S-X or imperial equivalent.

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

(d) Submerged Arc Welding (SAW):

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

(e) 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.

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

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.

E14.2.8 Galvanizing Touch-Up

Field-applied galvanizing shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-80 for "Repair of Damaged Hot Dip Galvanized 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.

Overhead field-applied galvanizing by zinc metallizing may be done with materials as specified for zinc metallizing in Specification E18, "Surface Preparation and Coating of Structural Steel".

E14.2.9 Non-Shrink Grout

Non-shrink grout shall be M-BED grout as manufactured by Sternson Limited. Approved equal is CPD Non-Shrink Grout. Other grout types may be acceptable if approved as equals by the Contract Administrator.

E14.2.10 Miscellaneous Materials

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

E14.3 Construction Methods

E14.3.1 General

The Work under this Specification shall include:

a) Supply of all materials including bearings, anchor bolts, grout, fasteners, and all incidental components.

b) Installation of anchor bolts including coring/drilling of holes and grouting.

c) Construction of grout pads.

d) Installation of neoprene pad bearings at West Abutment, Pier #2, Pier #4, Pier #5 and East Abutment.

as described here and as indicated on the Drawings or otherwise directed by the Contract Administrator.

E14.3.2 Fabrication

E14.3.2.1 General

All welding shall conform to the requirements of CSA Standard W59.1

All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material by commercial sand, grit or shop blasting or pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting or pickling.

E14.3.2.2 Shop Drawings

Shop drawings (three (3) prints and one (1) reproducible sepia copy) showing fabrication details of the bearings complete with additional plates where shown on the Drawing, anchor bolts, fasteners, and incidental components, shall be provided to the Contract Administrator for review at

least fourteen (14) working days prior to scheduled commencement of fabrication. No fabrication shall commence until approval from the Contract Administrator has been obtained.

E14.3.2.3 Tolerances

Overall dimension of assembled bearings shall be +/- 3 mm in plan and height.

E14.3.3 Installation

10.3.3.1 Anchor Bolts

The Contractor shall take extreme care so as not to damage the anchor bolts during construction. The Contractor shall be required to core or drill anchor bolt holes in the substructure concrete and grout them at each location according to the details shown on the Drawings.

The Contractor shall use a temporary template during grouting of the anchor bolts to ensure that they are accurately positioned. Holes for anchor bolts shall be filled with grout to 5 mm above the surface of the substructure unit.

E14.3.3.2 Grout Pads

The Contractor will be required to roughen and blast clean the top surface of West Abutment, Pier #5 and East Abutment where new grout pads will be located. New grout pads will then be formed and poured to the dimensions and details shown on the Drawings. Prior to pouring of grout, an epoxy bonding agent will be applied.

New grout pads on Pier #2 (East) and Pier #4 (West) will be formed and poured to the dimensions and details shown on the Drawings.

Bearing pads and plates shall be bedded over the entire area. Voids or hard spots after installation are not acceptable. The grout pads shall be moist cured for a minimum of 48 hours. Following the moist curing, the grout pads shall be coated with an approved curing compound.

Concrete surfaces in contact with the bearings shall not vary from a flat plane by more than 3 mm in 500 mm within the plan area of the bearing and local irregularities shall not exceed 1 mm.

E14.3.3.3 Installation of Bearing Assemblies on Substructure Units

The Contractor shall verify the condition of the bearings supplied to site during installation. The bearings shall be properly protected from damage or distortion.

Bearings shall be installed according to the details shown on the Drawings.

After positioning and adjustment of the bearing assemblies has been completed the steel superstructure shall be lowered onto the bearings. The bearing top plates shall be level before any load is transferred to the bearings.

E14.3.3.4 Galvanizing Touch-Up

Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.

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^{o}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^{o}C and to not apply direct flame to the alloy rods.

Overhead surfaces to receive field-applied galvanizing may be prepared and metallized as specified for zinc metallizing in Specification E18, "Surface Preparation and Coating of Structural Steel".

E14.4 Fabrication Guarantee

Before final acceptance of the bearings by the Contract Administrator, the bearing supplier (fabricator) shall provide the City with a written guarantee stating that they will perform satisfactorily for a period of five (5) years from the issuance of the Final Certificate. A representative of the bearing supplier shall inspect the bearing installation on site to ensure that the bearings have been properly installed. The supplier shall state that they have reviewed the installation procedures and find them in accordance with their recommendations. The supplier shall guarantee the replacement of the bearings at his cost in the event that the bearings do not perform satisfactorily.

E14.5 Installation Guarantee

The Contractor shall ensure that the bearings are installed in such a manner that will not void the fabricator's guarantee.

Similar to the bearing supplier, and before final acceptance by the Contract Administrator, the General Contractor shall guarantee, in writing, the performance of the bearings for a period of five (5) years from the date of issuance of the Certificate of Acceptance. Provide in the guarantee for the replacement of the bearings at no cost to the City, including all direct and indirect costs in the event that the bearings do not perform satisfactorily for a period of five (5) years from the date of issuance of the Certificate of Acceptance.

10.6 Method of Measurement

The supply and installation of bridge bearings will be paid for on a lump sum basis as accepted by the Contract Administrator, and no measurement will be made for this Work.

10.7 Basis of Payment

Supply and installation of bridge bearings will be paid for at the Contract Lump Sum Price for the "Items of Work" listed herebelow, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:

Bridge Bearings
a) Supply
b) Installation

E15. ALUMINUM PEDESTRIAN HANDRAIL AND LIFE PRESERVER ENCLOSURE

E15.1 Description

This Specification shall cover the supply and installation of aluminum pedestrian handrail and life preserver enclosure.

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.

E15.2 Materials

E15.2.1 General

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

All materials supplied under this Specification shall be of a type accepted by the Contract Administrator.

E15.2.2 Handling and Storage of Materials

All materials shall be handled and stored in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator.

E15.2.3 Testing

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.

E15.2.4 Material for the Aluminum Pedestrian Handrail and Life Preserver Enclosure

(a) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to CSA Aluminum Alloy and Temper HA.5 SG 11R-T6 (ASTM B221M-83 Alloy 6351-T6), or HA.7 GA 11M-T6 (ASTM B221 M-83 Alloy 6061-T6).

(b) Aluminum sheet, bar, support pin, angle, and plate shall conform to ASTM B221-M-83 Alloy 5083, ATM B209M-83 Alloy 6061-T6 or Alloy 6351-T6.

(c) Bolts and cap screws, nuts and lock washers - stainless steel conforming to ASTM A276, Type 316.

(d) Life preserve enclosurer front panels shall be 13 mm Lexan glazing.

E15.2.5 Bituminous Paint

Bituminous paint shall be an alkali-resistant coating and conform to CGSB 31-GP-3M. Supply of bituminous paint shall be considered incidental to the supply of aluminum pedestrian handrail.

E15.2.6 Handrail Anchorage System

Handrail anchorage system shall be stainless steel Acrow-Richmond Type DGRS-1 anchor insert c/w stainless steel high tensile anchor bolts and washers, all conforming to the requirements and dimensions as shown on the Drawings.

E15.2.7 Aluminum Shims

Aluminum shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the Drawings. Supply of shims will be considered incidental to the supply of aluminum pedestrian handrail.

E15.2.8 Attachments

Anodized aluminum components in contact with copper shall be isolated by way of neoprene pads and vandal proof nylon bolts.

E15.2.9 Aluminum Filler Alloys for Welded Construction

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

E15.2.10 Hinges

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

E15.3 Equipment

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

E15.4 Construction Methods

E15.4.1 Layout

Before fabrication and/or installation of the aluminum pedestrian handrail and life preserver enclosure, the Contractor shall satisfy himself as to the dimensions of all rail and enclosure sections required, by field measurements.

E15.4.2 Fabrication

E15.4.2.1 General

Shop Drawings three (3) prints and one (1) reproducible sepia copy showing fabrication details of the aluminum pedestrian handrail and life preserver enclosure shall be provided to the Contract Administrator for acceptance at least fourteen (14) days prior to scheduled commencement of fabrication.

The fabricator shall fabricate the entire aluminum pedestrian handrail and life preserver enclosure, in sections, to permit the installation of the rail sections in the concrete.

All fabrication shall be carried out in accordance with this Specification and the Drawings.

The punching of identification marks on the members will not be allowed.

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.

Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

Components of the hand railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

E15.4.2.2 Sample Panel

The Contractor shall be required to supply one completely fabricated 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 acceptance sample shall be kept by the Contract Administrator and shall become the standard for acceptance of all aluminum pedestrian handrail and life preserver enclosure.

E15.4.2.4 Cutting

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.

E15.4.2.5 Welding

Welded construction shall conform to the requirements of CSA Standard W59.2-M1991, Welded Aluminum Construction and W47.2-M1987, Certification of Companies for Fusion Welding of Aluminum.

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.

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-H11A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:

Guided Bend Test: All bend tests should be fully guided through an angle of 180°. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.

Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.

Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed 3% of the area under inspection.

E15.4.2.6 Bolting

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.

The finished diameter of the holes shall be not more than 7 percent greater than the nominal diameter of the fastener, except:

(a) Slotted holes for expansion purposes shall be provided as required on the Drawings.

(b) 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.

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.

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.

E15.4.3 Aluminum Pedestrian Handrail and Life Preserver Enclosure Installation

The aluminum pedestrian handrail and life preserver enclosure posts and sections shall be brought on-site and accurately installed as shown on the Drawings.

The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.

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.

Except where shown on the Drawings, field welding will 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.

E15.5 Quality Control

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.

E15.6 Method of Measurement

The supply and installation of Aluminum Pedestrian Handrail and Life Preserver Enclosure will be paid for on a lump sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E15.7 Basis of Payment

The supply and installation of Aluminum Pedestrian Handrail and Life Preserver Enclosure will be paid for at the Contract Lump Sum Price for the "Aluminum Pedestrian Handrail and Life Preserver Enclosure," measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E16. ALUMINUM BRIDGE SHOULDER BARRIER RAIL POSTS

E16.1 Description

Further to CW 3650-R4, this Specification shall cover the supply and installation of aluminum bridge shoulder barrier rail posts.

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

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

All materials supplied under this Specification shall be of a type approved by the Contractor Administrator.

E16.2.2 Handling and Storage of Materials

Bridge shoulder barrier rail posts shall be stored in neat regular piles on block or built-up platforms, in order to avoid damage or contamination and for ease of checking, handling and inspection.

All materials shall be handled carefully and transported in such a manner so as to ensure that the material is not damaged.

E16.2.3 Bridge Shoulder Barrier Rail Posts

Aluminum bridge shoulder barrier rail posts shall be supplied conforming to the requirements of the Drawings.

The bridge shoulder barrier rail posts shall conform to the requirements of ASTM B221-M83 Alloy 6061-T6 or Alloy 6351-T6 for extrusions, sheet and plate. Aluminum Filler Alloy for welded construction shall be ER5556. Welded construction shall conform to the requirements of CSA Standards CAN3-S157-M83, W59.2-M1991 and W47.2-1987.

All edges and corners of bridge shoulder barrier rail posts, extrusions and plates shall be rounded smooth as shown on the Drawings. Rounded edges damaged during installation shall be repaired by the Contractor to the satisfaction of the Contract Administrator.

E16.2.4 Rail Post Anchorage

Each rail post anchorage shall consist of an Acrow Richmond Type DGR-2-2 galvanized cast-in anchor complete with 4-25 mm galvanized A325 anchor bolts and nylon bushings. Refer to the drawings for layout and depth of cast-in anchors required.

E16.2.5 Rail Post Shims

Rail post shims shall conform to ASTM Standard B221 Alloy 6061-T6 and shall be supplied as required to facilitate the installation of the rail posts, as shown on the Drawings. Supply of the shims will be considered incidental to the supply of the rail posts.

E16.2.6 Alkali-Resistant Bituminous Paint

Alkali-resistant bituminous paint shall meet the requirements of CGSB Specification 31-GP-3M for corrosion-preventative compound cold application soft film.

E16.2.7 Anti-Seize Compound

The anti-seize compound to be applied to all threaded components when being assembled shall be LPS-3, manufactured by Holt-Lloyd (Canada Ltd.), Markham, Ontario, L3R 2Z3 or approval equal.

E16.2.8 Standby Materials

E16.2.8.1 Bridge Shoulder Barrier Posts

In addition to the aluminum bridge shoulder barrier rail posts to be installed on the bridge, the Contractor shall supply fifteen (15) bridge shoulder barrier posts as standby materials to the City Bridge Yard.

The Contractor shall unload and stockpile the standby posts to the satisfaction of the City Bridge staff. Two days' notice shall be given prior to the delivery of the standby posts to the City Bridge Yard located at Ravelstone Avenue and Plessis Road.

Payment for the standby posts will be made for supply of posts only. No payment will be made for installation. The delivery and unloading of the standby posts shall be deemed incidental to the supply of barrier rail posts.

E16.2.8.2 Rail Post Shims

The Contractor shall also supply an additional thirty (30) rail post shims of various sizes as standby materials, to be delivered to the City Bridge Yards at the same time as the standby post identified in this Clause. The supply of these standby shims shall be incidental to the Works of this Specification.

E16.3 Equipment

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 Fabrication of Bridge Shoulder Barrier Rail Posts

Bridge shoulder barrier rail posts shall be supplied by the Contractor, completely fabricated, as shown on the Drawings.

Welded construction shall conform to the requirements of CSA Standards CAN3-S157-M83, "Strength Design in Aluminum", W47.2, "Certification of Companies for Fusion Welding of Aluminum", and W59.2, "Welded Aluminum Construction".

E16.4.2 Installation of Bridge Shoulder Barrier Rail Posts

The rail posts shall be installed using the galvanized rail post anchor bolts. This shall be undertaken in a careful workmanlike manner to the grade and alignment shown on the Drawings, or as directed by the Contract Administrator.

The grade of the bridge shoulder barrier rail posts must be averaged over irregularities in the top elevations of the support concrete to ensure a smooth and uniform grade on the barrier rail. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be painted with two coats, each 1 mm in thickness of alkali-resistant bituminous paint, which is to be dry prior to installation. A minimum of one 3 mm aluminum shim shall be installed under each post.

E16.4.3 Replacement of Damaged Materials

In the event of damage to any materials, the Contractor shall immediately notify the Contract Administrator and make all repairs or replacements necessary, at his own expense, to the satisfaction of the Contract Administrator. In no case shall the Contractor install a damaged component on the barrier.

E16.5 Quality Control

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.

Welding processes, materials, workmanship shall be tested in accordance with the requirements of CSA Standards W47.2, "Certification of Companies for Fusion Welding of Aluminum", and W59.2, "Welded Aluminum Construction".

E16.6 Method of Measurement

The supply and installation of bridge shoulder barrier rail posts will be measured on a Unit Basis. The number of bridge shoulder barrier rail posts to be paid for shall be the total number of bridge shoulder barrier rail posts supplied and installed in accordance with this Specification and accepted by the Contract Administrator.

E16.7 Basis of Payment

The supply and installation of bridge shoulder barrier rail posts will be paid for at the Contract Unit Price per unit for the "Items of Work" listed below, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:

Aluminum Bridge Shoulder Barrier Rail Posts
a) Supply
b) Installation

E17. ALUMINUM BRIDGE SHOULDER BARRIER RAIL

E17.1 Description

Further to CW 3650-R4, this Specification shall cover the supply and installation of aluminum bridge shoulder barrier rail on the aluminum bridge shoulder barrier rail posts.

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

E17.2 Materials

E17.2.1 General

All materials supplied under this Specification shall conform to the requirements of Standard Construction Specification CW 3650-R4 and as specified herein.

E17.2.2 Cap Screws

Cap screws shall be stainless steel conforming to ASTM A276, Type 316.

E17.2.3 Standby Materials

In addition to the aluminum bridge shoulder barrier rails to be installed on the bridge, the Contractor shall supply the following standby materials to the City Bridge Yard:

1) Three (3) aluminum barrier rails (11713 length)
2) Two (2) aluminum barrier rails (10820 length)

The Contractor shall unload and stockpile the standby materials to the satisfaction of City Bridge staff. Two days' notice shall be given prior to the delivery of the standby materials to the City Bridge Yard.

Payment for the standby rails will be made for supply of the rails only. The delivery and unloading of the standby rails shall be incidental to the supply of the rails.

E17.3 Equipment

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

E17.4 Construction Methods

E17.4.1 Fabrication of Aluminum Bridge Shoulder Barrier Rail Components

The fabrication of aluminum bridge shoulder barrier rail components shall include all cutting, slotting, welding, and grinding.

All fabrication shall be carried out in accordance with CW 3650-R4 and this Specification and as shown on the Drawings.

The punching of identification marks on the members will not be allowed.

Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may approve remedial measures.

Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

The fabrication of the aluminum bridge shoulder barrier rail components shall be considered incidental to the Work of this Specification, and no separate measurement or payment shall be made for same.

E17.4.2 Sharp Edges

Sharp edges on all the barrier rail components shall be removed to the satisfaction of the Contract Administrator prior to installation of the rails.

E17.4.3 Installation

The installation of aluminum bridge shoulder barrier rail shall conform to the requirements of Standard Specification CW 3650-R4, and as shown on the Drawings, to the satisfaction of the Contract Administrator.

E17.5 Method of Measurement

The supply and installation of aluminum bridge shoulder barrier rail will be measured on a linear measure basis. The number of linear metres to be paid for shall be the total number of linear metres of aluminum bridge shoulder barrier rail supplied and installed in accordance with this Specification and accepted by the Contract Administrator, as computed by summing up the horizontal length of the individual rail lengths.

E17.6 Basis of Payment

The supply and installation of aluminum bridge shoulder barrier rail will be paid for at the Contract Unit Price per linear metre for the "Items of Work" listed herebelow, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:

Aluminum Bridge Shoulder Barrier Rail
a) Supply
b) Installation

E18. SURFACE PREPARATION AND COATING OF STRUCTURAL STEEL

E18.1 Description

This Specification shall cover surface preparation and coating of designated existing structural steel throughout the bridge as specified herein.

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

E18.2 Materials

E18.2.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and approval by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

E18.2.2 Coatings

E18.2.2.1 Galvanizing Coating (Zinc Metallizing)

The galvanizing coating shall consist of a zinc metallizing process utilizing a 100% zinc base.

E18.2.3 Coating Material Supply Requirements

All metallizing material shall be delivered in the original unopened spools with manufacturer's labels intact. Any material that has been damaged or otherwise deteriorated shall not be used. The Contractor shall provide, if and when requested by the Contract Administrator, a listing, updated weekly, of the weight and number of spools and the type of metallizing material (as identified by a mill test report and corresponding heat number for each spool) received from the metallizing manufacturer on this project.

All material shall be stored under cover in a secured place as approved by the Contract Administrator and shall be kept within storage temperature limitations recommended by the manufacturer.

E18.2.4 Abrasive for Blast Cleaning

The blast-cleaning abrasive shall be free of corrosion-producing contaminants. Sand abrasive shall be oil free. Slag abrasives shall contain no more than 0.1% oil by weight. The blast-cleaning abrasive and grit size employed shall be capable of achieving an average profile peak-to-valley height of at least 2.5 mils and not exceeding 3.5 mils.

E18.2.5 Incidental and Miscellaneous Materials

Incidental and miscellaneous materials utilized in undertaking the surface preparation and coating Works shall be supplied strictly in accordance with the manufacturer's guidelines, as approved in advance by the Contract Administrator, and in accordance with these Specifications.

This will include solvent mixtures associated with solvent cleaning operations, and any other incidental materials used in conjunction with the Works of this Specification.

The use of all such materials shall be reviewed with the Contract Administrator to ensure conformance with the Specification, prior to the use of same in the Works. The Contract Administrator's decision in these matters shall be final.

E18.2.6 Water

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

E18.3 Equipment

E18.3.1 Surface Preparation Equipment

All equipment shall be of a type approved by the Contract Administrator and capable of preparing the existing structural steelwork surfaces in accordance with these Specifications.

E18.3.2 Coating Application Equipment

The coating application equipment shall be designed such that the coating will be applied uniformly to all surfaces in the locations required as shown on the Drawings and approved by the Contract Administrator and shall be kept in good working order.

E18.3.3 Wash Cleaning Equipment

Wash cleaning equipment shall provide a high pressure water wash capable of cleaning the existing structural steelwork suitable to receive the coating in accordance with these Specifications.

E18.4 Construction Methods

E18.4.1 Scope of Work

The Works involve surface preparation of designated areas of the superstructure and substructure structural steel, and application of maintenance coating systems thereto, as described herebelow in Table E18.4.1.

TABEL E18.4.1

SURFACE PREPARATION	COATING
SSPC-SP12WJ4-NV2 High Pressure Water Cleaning SSPC SP10 Near White Metal Blast	Galvanizing Coating (zinc metallizing)

E18.4.2 Traffic and Pedestrian Control

Traffic and pedestrian control shall be as set forth in Supplementary Condition D23, D24 and D25 and pedestrian accommodation shall be in accordance with Specification E4, "Pedestrian and Traffic Protection/Accommodation".

In no case shall any Work commence without traffic and pedestrian control/accommodation measures in place to the satisfaction of the Contract Administrator.

E18.4.3 Access

Access methods for workers and equipment to the underside of the structures must be submitted by the Contractor and approved by the Contract Administrator at least two (2) working days prior to the proposed commencement of construction.

E18.4.4 Coating Methods and Scheduling

At least ten (10) days prior to the scheduled commencement of any surface preparation and coating operations, the Contractor shall submit to the Contract Administrator, the proposed schedule, methods and sequence of operations for review and approval.

Drawings sealed by a Professional Engineer registered in the Province of Manitoba shall be submitted detailing the Contractor's proposed scaffolding, platforms, and swingstages to be employed. All scaffolding, platforms, and swingstages shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health Division requirements. No Works shall commence without prior written approval of the Contract Administrator.

E18.4.5 Precautions Against Overspray and Splatter

Prior to undertaking any Works, the Contractor shall take all necessary precautions to prevent blast-cleaning overspray and overspray/splatter/drift of the primer and coating, all in accordance with E19, Environmental Protection. All splatter, overspray, and spills shall be promptly removed by the Contractor at his own expense to the satisfaction of the Contract Administrator.

The Contractor must provide adequate protection against sandblast or coating damage to the substructure, bearings, vehicles, water crafts, private property, and the public in the vicinity of the bridge. The Contractor will be held solely liable for any damages or claims resulting from the blast cleaning and coating operations.

E18.4.6 Surface Preparation

E18.4.6.1 General

Prior to actual Work commencement, representative trial areas shall be cleaned in accordance with SSPC Specifications.

The degree of cleaning and surface profile (where required) achieved, once accepted by the Contract Administrator, will become the standard for all subsequent surface preparations. Furthermore, the Contractor shall prepare and maintain blasted reference panels for the purpose of calibrating magnetic dry film thickness gauges as specified in SSPC Specification PA2.

E18.4.6.2 Surface Cleaning

Before any surface cleaning operations may commence, the Contractor shall have in place an approved Environmental Protection and Capture System as specified in E19.

(a) General

Before any blast cleaning operations or any coating applications commence, the following surface cleaning operations shall be undertaken on all structural steel members designated to receive a coating system:

i) All organic materials such as bird droppings, nests and any other non-structural obstructions or pollutants attached to the steel are to be removed by hand cleaning operations.

ii) All oil and grease shall be removed manually with solvent cleaning as per SSPC Specification SP1.

iii) The entire area shall be washed clean of road salt using high pressure water washing.

(b) Blast Cleaning Operation

The Contractor shall prepare the designated structural steel immediately prior to coating, by blast cleaning as specified in Table E18.4.1 hereinbefore.

No rust scale shall remain within the designated areas.

Any areas shielded or hidden from the effects of sandblasting shall be cleaned manually or by other means to the satisfaction of the Contract Administrator.

The blasting shall be performed so as not to damage or contaminate any previously coated areas.

Freshly prepared steel shall be coated as quickly as practical thereafter. However, if the freshly prepared steel begins to rust prior to application of the coating, the steel must be reblasted to meet the applicable SSPC Specification.

Where the coating has been damaged or rejected, remove loose or rejected coating to meet surface preparation Table E18.4.1. Cleaning shall be performed approximately 20 mm beyond the damaged areas in all directions or until soundly-adhered coating is obtained.

E18.4.6.3 Clean-up Operations

Following all blast cleaning operations and prior to the Contract Administrator's inspection, all surfaces involved shall be blown off with compressed air or cleaned by vacuum for the purpose of removing any and all traces of blast products from the surface, and for the removal of abrasive from all pockets and corners.

Following surface preparation clean-up operations, the Contractor shall immediately notify the Contract Administrator so that an inspection can be made prior to the application of coating.

The coating shall be applied as soon as possible after the surface preparation clean-up operation as approved by the Contract Administrator.

E18.4.6.4 Surface Testing and Inspection

The Contractor shall provide the Contract Administrator with a minimum of four (4) hours notice prior to coating, to allow for testing and inspection of prepared surfaces.

Immediately following blast cleaning and clean-up operations, the Contractor shall notify the Contract Administrator in order that a chemical analysis of the blasted steel be carried out. No coating shall be applied to any prepared surface until written acceptance of complete surface preparation of an area has been given by the Contract Administrator.

The Contract Administrator will analyze the blasted steel surface for chloride ion content.

Coating shall not be applied to any surface that either exceeds an average of 30 milligrams per square metre chloride ion content, based upon three readings taken from three separate areas of 150 mm x 150 mm each, or that any one reading exceeds 50 milligrams per square metre chloride ion content. Any area found to exceed these upper limits shall be high pressure water wash cleaned using a soluble salt removing chemical such as Chlor Rid DTS, and reblasted by the Contractor at no extra cost to the City, and then retested by the Contract Administrator.

At the same time, the Contract Administrator will take thickness readings of the prepared surface. Based on the steel thickness reading results, structural repairs to the prepared areas may be deemed necessary by the Contract Administrator. In this event, the Contractor shall move to another area of the Work prior to coating until such repairs have been performed.

If there is such a requirement to rehabilitate any item, the Contractor will undertake the Works under the Contract, based on the tendered price for structural steel for miscellaneous bridge repairs . Once the Contract Administrator has approved the completed rehabilitation of any applicable item, the Contractor will be advised that he can commence coating operations at that item.

E18.4.7 Coating Application

E18.4.7.1 General

The areas to be coated shall undergo additional cleaning operations as required, to remove any new rust to ensure a clean surface exists at the time that application of the coating commences in accordance with the Specifications.

Under no circumstances shall the coating be applied until the surface preparation has been inspected and approved by the Contract Administrator immediately prior to commencement of coating application operations.

Coating shall only be carried out when the surfaces are dry, free of dirt, oil, grease and other surface contaminants.

Coating shall not be carried out:

(a) When the temperature of the air or steel is below 5°C.

(b) Unless the temperature of the steel is at least 5°C above the dewpoint.

(c) If the temperature is expected to drop below 0°C during the coating drying period.

(d) If the relative humidity exceeds the coating manufacturer's written recommendations.

Any coating damaged by cold, heat or other environmental condition shall be replaced by the Contractor to the satisfaction of the Contract Administrator.

The minimum recoat time, as agreed upon by the Contract Administrator and specified by the coating manufacturer, must be adhered to when coating at lower temperatures before application of next coat.

E18.4.7.2 Coating Thickness

The coating shall consist of the dry film thicknesses, based on percentage of solid content by volume; in accordance with Table 18.4.7.2 herebelow:

TABLE 18.4.7.2

ITEM	% SOLIDS CONTENT BY VOLUME	DRY FILM THICKNESS
GALVANIZING COATING		
Zinc Metallizing to 2500 above sidewalk surface	100%	10 mils
Zinc Metallizing above 2500 above sidewalk surface	100%	5 mils

* Thickness as measured over the peaks of the blast profile, as specified herein.

* Based on the requirement of CSA Standard G164-M1981 to a net retention of 600 g/m^2.

The coating thicknesses specified herein shall be the thickness over the peaks of the blast profile. To ensure this thickness is being measured, dry film thickness measurements and gauge calibration methods shall be as described in SSPC Specification PA2.

When the dry film thickness for an area, measured as specified herein, averages less than the thickness specified or has any spot thickness less than the minimum spot thickness specified herein, then additional layer(s) of the same materials shall be applied until the minimum required thickness is attained.

Zinc Metallizing shall be applied by either of the following methods: flame spray or electric arc spray. The existing metal shall not be heated to a temperature exceeding 350°C.

Minimum times between coats shall be in compliance with the manufacturer's written instructions. The Contract Administrator reserves the right to require longer times, as he sees fit.

E18.4.7.3 Clean-up Operations

All areas of overspray, spillage, leakage, etc., shall be immediately cleaned up to the satisfaction of the Contract Administrator.

E18.4.8 Extent of Surfaces to be Coated

Surfaces shall be coated with the specified coating to the extents shown on the Drawings.

E18.5 Quality Control

E18.5.1 General

The Contractor shall supply coating samples to the Contract Administrator or his Inspector for testing purposes, from time to time as required. There shall be no charge to the City for samples taken.

The Contractor shall arrange for regular site visits by a representative of the coating manufacturer who shall ensure that the coating is being applied in accordance with the manufacturer's recommendations. The Contract Administrator shall be notified of each such visit and may request additional visits. The Contract Administrator shall be immediately advised of any proposed deviation from this Specification or the manufacturer's requirements.

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations, from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

The zinc metallizing shall achieve adhesion of at least 500 psi to the steel as determined by testing per ASTM 4541.

E18.5.2 Guarantee

(a) Manufacturer Guarantee

The Contractor shall ensure that the manufacturer/supplier of each coating type shall provide to the Contract Administrator written guarantee within five (5) working days of contract award stating that the product will perform satisfactorily for a minimum period of five (5) years from the date of issue of the Certificate of Total Performance, provided that both the application and surface preparation of the coating has been carried out in accordance with this Specification. The Supplier shall state that they have reviewed these Specifications and the application and surface preparation procedures and find them in accordance with their recommendations. The Supplier shall guarantee the replacement of the coating materials at no cost to the City in the event that the coating does not perform satisfactorily.

(b) Surface Preparation and Application Guarantee

The General Contractor shall ensure that the surface preparation and coating application is performed in such a manner that will not void the manufacturer's guarantee.

The General Contractor shall provide to the Contract Administrator a guarantee in writing, stating that the coating system will perform satisfactorily for a period of five (5) years from the date of issue of the Certificate of Total Performance. He shall provide in the guarantee for the reapplication of the coating system at no cost to the City in the event that the coating system does not perform satisfactorily.

E18.6 Method of Measurement

E18.6.1 Surface Preparation of Structural Steel for Galvanizing Coating (Zinc Metallizing)

Surface preparation of structural steel, as defined in this Specification, will be paid for on a lump sum basis as accepted by the Contract Administrator, and no measurement will be made for this Work.

E18.6.2 Coating of Structural Steel for Galvanizing Coating (Zinc Metallizing)

Coating of structural steel will be paid for on a lump sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E18.7 Basis of Payment

E18.7.1 Surface Preparation of Structural Steel for Galvanizing Coating (Zinc Metallizing)

Surface preparation of structural steel will be paid for at the Contract Lump Sum Price, for the "Items of Work", listed herebelow, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work

Surface Preparation of Structural Steel

Option I - Surface preparation of all steel members from above the bearings to approximately 2.5 metres above the sidewalk level for galvanizing coating (zinc metallizing).

Option II - Surface preparation of steel members from above the bearing to the top of the structures for galvanizing coating (zinc metallizing).

E18.7.2 Coating of Structural Steel for Galvanizing Coating (Zinc Metallizing)

Application of coating to the prepared structural steel will be paid for at the Contract Lump Sum Price, for the "Items of Work", listed herebelow, measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work

Application of Coating to Prepared Structural Steel

Option I - Coating all steel members from above the bearings to approximately 2.5 metres above the sidewalk level.

Option II - Coating all steel members from above the bearings to the top of the structures.

E19. ENVIRONMENTAL PROTECTION

E19.1 Description

This Specification shall cover all Works associated with the provision of environmental protection and capture systems associated with all site Works, as specified herein.

E19.2 Materials

E19.2.1 General

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

E19.2.2 Miscellaneous Materials

Miscellaneous materials shall conform to the requirements indicated on the Drawings and as required for a complete installation and as approved by the Contract Administrator.

E19.3 Equipment

E19.3.1 General

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

E19.4 Construction Methods

E19.4.1 Scope of Work

It is intended that this Specification cover the following Works associated with environmental protection:

a) Containment, collection and disposal of spent sandblasting abrasive and new coating overspray (hazardous waste per testing report provided in Appendix A).

b) Containment, collection and disposal of debris generated by concrete demolition Works as well as reinforcing steel and concrete surface preparation Works (non-hazardous waste unless contaminated with spent sandblasting abrasive and new coating overspray).

E19.4.2 General

In general the Contractor shall ensure that the debris from concrete demolition Works, surface preparation of structural steel, reinforcing steel and concrete surfaces and the overspray from coating application will not result in harmful effects or nuisance to river, land, buildings, vehicles, pedestrian and water craft in the vicinity of the Contract area.

The Contractor shall conduct his operations in accordance with all current Federal, Provincial or other regulations with respect to environmental protection and pollution control. It shall be the Contractor's responsibility to be familiar with all applicable environmental regulations, to obtain all necessary approvals and permits for his operations and to ensure that all applicable environmental requirements are met and adhered to.

E19.4.3 Allowable Construction Loads

The Contractor is advised that the Redwood Bridge is a structure with a live load restriction during normal operation. For this reason, the following weight restrictions shall be strictly enforced during construction and while the closure is in effect.

a) Single and Tandem Axle Trucks - maximum single axle load of 9,000 kilograms, maximum tandem axle load of 16,000 kilograms, maximum Gross Vehicle Weight - 20,000 kilograms.

b) Semi-Trailer Trucks - Maximum single axle load of 9,100 kilograms, maximum tandem axle load of 16,000 kilograms, maximum gross vehicle weight of 36,500 kilograms.

c) The loading from all equipment, platforms, forms, materials, Work persons, etc. shall be restricted so that the total moments and shears in the concrete deck, steel floor stringers and steel floor beams are less than or equal to that produced by AASHTO HS20 truck loading and restricted so that the total moments and shears and axial loads in the steel truss members are less than or equal to that produced by AASHTO HS20 lane loadings. The Contractor shall have this verified by a Professional Engineer registered in the Province of Manitoba. Detailed design notes and drawings for each stage of construction, bearing the Professional Engineer's seal, shall be submitted to the Contract Administrator for review. This shall be submitted at least 7 days prior to carrying out each stage of the Works.

d) Vehicle speed on the bridge and on site shall under no circumstances exceed a limit of 10 kilometres per hour during construction.

e) The following further load and equipment restrictions will apply during the replacement of any part of any steel members in the trusses.
- Deck shall be removed.
- Loading from any Work platforms shall be less than 1.2 kPa (25 psf).
- Only materials and equipment required to replace that one part of the member will be permitted on the span. The equipment shall be the smallest that is required to do the Work and it shall be placed as far as possible from the member which will have that one part replaced.

f) The following further load and equipment restrictions will apply during the placing and curing of deck concrete (curing to 20 MPa verified by field cure test cylinders):
- No equipment allowed on the span except approved placing and finishing equipment and they shall be removed from the span as soon as possible after casting deck concrete.
- No materials on the affected span except for required forms, reinforcing steel, the concrete and the Work platforms (loading from Work platforms shall not be greater than 1.2 KPa).

E19.4.4 Containment, Collection and Disposal

1) Spent Sandblasting Abrasive and Coating Overspray (Hazardous Waste)

The Contractor is advised of the general concern regarding contamination of land areas and waterways by old paint, blasting abrasives and new coating materials. The Contractor shall ensure that such contamination does not take place.

The Contractor shall provide for containment of the superstructure steel areas during all surface preparation and coating application operations. The containment shall be achieved by hoarding (tarps, scaffolding, etc.) so that the structure is enclosed in order to prevent spent blasting abrasives, cleaned-off paint residue and new coating material overspray from migrating to outside the enclosure.

The Contractor shall ensure that the amount of blasting medium to remove old paint and the amount of overspray from the application of new coating material is kept to the absolute minimum by conscientious efforts of his workforce and by efficient use of equipment.

The Contractor shall collect all spent blasting abrasives, cleaned-off paint residue and new coating material overspray from the Work area. All such materials shall be disposed of off site by the Contractor in accordance with the appropriate regulations to the satisfaction of the appropriate environmental authority and the Contract Administrator.

The Contractor is advised that the waste that will be generated will be classified as hazardous waste as determined by MR 282/87 respecting Classification Criteria for Products, Substances and Organisms Regulation under the Dangerous Goods Handling and Transportation Act. The Contractor in accordance with Manitoba Regulation 175/87 shall apply for and submit an initial Generator Registration Report to the Director of Environmental Approvals to obtain a Provincial Registration Number prior to beginning the rehabilitation Works. The Contractor shall employ a licensed Hazardous Waste Carrier to remove, transfer and dispose this hazardous waste at a facility licensed to receive hazardous waste in accordance with the requirements under the City's Provincial Registration Number 1001-195 including all costs for transportation, storage, and disposal of this hazardous waste.

At least fourteen (14) working days prior to scheduled commencement of any surface preparation and coating operations, the Contractor shall submit to the Contract Administrator for review the proposed schedule, methods, sequence of operations and all applicable details related to the proposed containment, collection and disposal procedures.

Design drawings sealed by a Professional Engineer registered in the Province of Manitoba shall be submitted detailing the Contractor's proposed containment hoarding system. The details will not be accepted if not sealed by the Professional Engineer. The submission of such details to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the containment hoarding system. The containment hoarding shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health requirements. No Work shall commence before the Contract Administrator has completed the review and advised the Contractor. As part of his responsibilities, the design Engineer whose seal is on the documents will be required to inspect the containment hoarding on site to ensure conformity with the design. The design Engineer will certify this conformity in writing and submit this certification to the Contract Administrator.

2) Non-Hazardous Waste

The Contractor is advised of the general concern regarding contamination of land areas and waterways by the debris generated from concrete and wood removal Works. The Contractor shall ensure that such contamination does not take place.

The Contractor shall take necessary precautions to ensure that bridge materials do not fall onto the ground or into the water areas below during concrete and wood removal Works. The Contractor shall provide, erect and maintain platforms, hoarding and other structures as required to catch and retain all concrete and wood waste materials.

Any debris that falls off the bridge shall be immediately cleaned up by the Contractor at his own expense.

All waste material generated from the concrete and wood removal Works shall become the property of the Contractor. The Contractor shall promptly remove all debris generated by these Works off and away from the site. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

E19.5 Quality Control

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

The Contract Administrator reserves the right to reject materials or Works which are not in accordance with the requirements of this Specification.

E19.6 Method of Measurement

Environmental protection during surface preparation and painting will be paid for on a lump sum basis and no measurement will be made for this Work.

E19.7 Basis of Payment

Provision of environment protection will be paid for at the Contract Lump Sum Price for "Items of Work" listed here below, measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work

Environmental Protecting

Option I	-	For concrete and wood removals plus Option I surface preparation and coating of structural steel.
Option II	-	For concrete and wood removals plus Option II surface preparation and coating of structural steel.

E20. ELECTRICAL

E20.1 Description

This Specification shall cover the supply and installation of lighting conduits, lighting fixtures, pull boxes, junction boxes, couplings, and all required appurtenances and incidental components to serve the underbridge lighting, as specified herein.

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

E20.2 Materials

E20.2.1 General

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

E20.2.2 Handling and Storage of Materials

All materials shall be handled and stored in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator.

E20.2.3 Testing

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the Owner for any materials taken by the Contract Administrator for testing purposes. Furthermore all material supplied and installed shall be CSA approved.

E20.2.4 Lighting Fixtures

All lighting fixtures covered by this Specification and as specified in the luminaire schedule on the Drawings are to be supplied by the Contractor.

E20.2.5 Conductors

Manitoba Hydro shall supply and install all conductors.

The Contractor is to ensure the length of leads for Type A luminaires is sufficient to be routed through the poles, bases, and/or structure to tie into the wiring provided by Manitoba Hydro. Type A luminaires are to be wired and connected by the Contractor. Refer to the Drawings for indication of other wiring supplied and installed by the Contractor.

E20.2.6 Conduits and Related Materials

All conduit shall be as specified on the Drawings or otherwise accepted by the Contract Administrator in accordance with the Canadian Electrical Code, unless otherwise specified.

All conduits, pull boxes and junction boxes for the lighting electrical embedded Work shall be Rigid PVC (polyvinyl chloride) conforming to the requirements of CSA C22.2 No. 136.

All covers for boxes shall be stainless steel and fastened with stainless steel vandal-proof screws.

Flexible couplings shall be such as Crouse-Hinds Type EC or equal accepted by Contract Administrator.

E20.2.7 Cast-in-Place Boxes

The Contractor shall supply and install all cast-in-place boxes for all recessed fixtures, as specified on the Drawings.

E20.3 Equipment

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

E20.4 Construction Methods

E20.4.1 General

The Work shall include the supply and installation of all conduits, lighting fixtures, pull boxes, junction boxes, couplings, fish wire, and all lighting required appurtenances and incidental components.

E20.4.2 Permits, Codes, and Regulations

The Contractor shall be responsible to obtain and pay for all electrical permits, inspections, etc., required by the authorities having jurisdiction over this Work, and shall provide a copy of each permit to the Contract Administrator before commencing any Work on the site.

The Work shall be carried out in accordance with the latest regulations of the Canadian Electrical Code and all applicable Municipal and Provincial Codes and Regulations. In no instance, however, shall the standard established by the Drawings and Specifications be reduced by any of the Codes referred to above.

E20.4.3 Placing of Conduits, Pull Boxes, and Junction Boxes

E20.4.3.1 General

All conduits, pull boxes and junction boxes shall be placed as shown on the Drawings. The conduit support system to be placed in concrete shall be firmly anchored in place to prevent movement during pouring of the concrete. Extreme care shall be exercised when pouring concrete to prevent damage to any conduit support system. The open ends of the conduits shall be suitably capped, to protect the conduit from damage. The conduit system shall be watertight.

Fish wire shall be placed in all conduits and shall be firmly anchored at the open ends of the conduits. The Contractor shall drill a small hole in the conduit cap for passage of the fish wire.

Upon completion of the conduit system, the Contractor shall ascertain that no obstructions are blocking any conduit. If any obstruction is encountered, it shall be removed by the Contractor at his own expense.

E20.4.4 Electrical Conductors

Electrical conductors shall be supplied and installed by Manitoba Hydro.

E20.5 Quality Control

E20.5.1 General

All workmanship and all materials finished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work.

The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or 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.

E20.6 Method of Measurement

The supply and installation of Lighting Conduit, Pull Boxes, and Junction Boxes for Lighting, and Lighting Fixtures will be paid for on a lump sum basis for all types of conduit supplied and/or installed in accordance with this Specification, accepted by the Contract Administrator, and no measurement will be made for this Work.

E20.7 Basis of Payment

The supply and installation of Lighting Conduit, Pull Boxes, and Junction Boxes for Lighting, and Lighting Fixtures will be paid for at the Contract Lump Sum for "Electrical", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E21. LARGE STONE RIPRAP

E21.1 Description

E21.1.1 This Specification shall cover the supply and installation of geotextile filter fabric and riprap.

E21.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supply, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E21.1.3 Materials

(a) General

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

(b) Handling and Storage of Materials

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

(ii) Under no circumstances will stockpiling of riprap materials be allowed on the riverbank.

E21.1.4 Large Stone Pier Riprap

(a) Rock for riprap shall consist of hard, dense, durable blasted limestone. The rock shall be resistant to the erosive actions of air and water, and be suitable in all other respects for the purpose intended. The rock shall range in size from 100 mm to 1200 mm in diameter, with at least fifty (50%) percent being larger than 600 mm. The rock for riprap shall be accepted by the Contract Administrator prior to placement.

E21.1.5 Pea Gravel

(a) Material is to consist of sound, hard, non-crushed rock free from organic or soft material that would disintegrate through decay or weathering. 100% to pass 20,000 sieve and no material smaller than 5000 sieve size.

E21.1.6 Geotextile Filter Fabric

(a) Filter fabric shall be a non-woven polyester geotextile. Accepted products are Mirafi 170 NP, Trevira 1125 or Nilex 4553 (C34).

E21.1.7 Testing

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

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

E21.2 Equipment

E21.2.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E21.3 Construction Methods

E21.3.1 General

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

E21.3.2 Excavation

(a) The Contractor shall excavate 350 deep to facilitate the placement of the geotextile filter fabric and riprap. All material shall be carefully placed on prepared ground. Extreme caution shall be taken to ensure that remaining natural and vegetative features are not damaged by placement equipment.

(b) Storage of excavated material on site shall be kept to a minimum and at no time shall stockpiled excavated material exceed 30 m^3. Any damage caused by stockpiled excavated material shall be repaired to the satisfaction of the Contract Administrator and at no cost to the City.

E21.3.3 Placement of Geotextile Filter Fabric

(a) Prior to placement of the geotextile filter fabric, the Contractor shall excavate the area to receive the geotextile filter fabric as required, and ensure that the area is free from sharp objects that may puncture the fabric as riprap material is placed upon it. Any trees requiring removal shall be disposed of at a disposal area approved by the City Forestry Department.

(b) Geotextile filter fabric shall be installed directly on the prepared ground. The limit shall be as shown on the Drawings, and as directed by the Contract Administrator. The filter fabric shall be rolled loosely so it will conform to the contours of the terrain.

(c) Adjacent strips of filter fabric shall be overlapped by a minimum of 450 mm, and be pinned together using 150 mm long nails spaced at 450 mm. Care must be taken to avoid puncturing or tearing the material. Any damaged geotextile filter fabric shall be replace by the Contractor at his own expense.

E21.3.4 Placement of Riprap Materials

(a) The placing of the riprap material shall be done to the line and grade as determined by the Contract administrator, and to the cross-section as shown on the Contract Drawings. In addition, installation of the riprap material shall be done in such a manner so as to minimize disruption of in-place geotextile filter fabric and soils. Prior to installing any riprap materials, the Contractor shall confirm, with the Contract Administrator, the proposed methods of placement.

(b) Riprap shall be placed in such a manner that the larger stones are uniformly distributed, and smaller rocks serve to fill the spaces between the larger rock. Sufficient handwork shall be done to ensure a neat and uniform surface to the cross-section and alignment as shown on the Drawings, and to the satisfaction of the Contract Administrator.

(c) Storage of riprap material on site shall be kept to a minimum and at no time shall stockpiled riprap material exceed 30 m^3. Also, the location of stockpiled riprap material shall be limited to the area on the roadway east of the east abutment that is to be overlaid with asphalt and limited to the time prior to carrying out the asphalt overlay. Any damage caused by stockpiled riprap material shall be repaired to the satisfaction of the Contract Administrator and at no cost to the City.

E21.3.5 Placement of Pea Gravel Material

(a) After the riprap rocks 600 to 1200 mm in diameter has been placed, infill with pea gravel to a depth of 200 mm. Then place riprap rocks smaller than 600 mm in diameter to fill the spaces between the larger rock.

E21.4 Quality Control

E21.4.1 Inspection

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

E21.4.2 Access

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

E21.4.3 Materials

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

E21.4.4 Corrective Action

(a) Any geotextile filter fabric and riprap material that does not meet the gradation and/or placement requirements of this Specification shall be removed and replaced by the Contractor at his own expense, to the satisfaction of the Contract Administrator.

E21.5 Method of Measurement

E21.5.1 Supply and Installation of Geotextile Filter Fabric

(a) The supply and installation of the geotextile filter fabric shall be considered incidental to the supply and placement of the large stone riprap and no measurement will be made for this Work.

E21.5.2 Large Stone Riprap

(a) The supply and installation of Large Stone Riprap will be paid for on a lump sum basis, as accepted by the Contract Administrator and no measurement will be made for this Work.

E21.5.3 Pea Gravel

(a) The supply and installation of Pea Gravel shall be considered incidental to the large stone riprap and no measurement will be made for this Work.

E21.6 Basis of Payment

E21.6.1 Large Stone Riprap

(a) The supply and placement of Riprap will be paid for at the Contract Lump Sum Price for “Large Stone Riprap", which price shall be payment in full for supplying and placement of all materials and performing all operations herein described and all other items of Work incidental to the Work included in this Specification.

E22. ACCELERATED COMPLETION

E22.1 Description

E22.1.1 This Specification shall cover the accelerated completion of the Works of this Contract.

E22.2 Acceleration of Work

E22.2.1 At no risk to the City, the Contractor at his own initiative, means and expense, may undertake to complete the Works of this Contract to facilitate the safe re-opening of the entire bridge facility to traffic in advance of the Substantial Completion date of October 15, 2006, specified herein.

E22.2.2 In recognition of the fact that an early completion of the Works is of benefit to the City, the City will compensate the Contractor for said early completion on a per diem unit price basis, as hereinafter set out, provided that the City will not be liable to pay for any period of acceleration in excess of forty-five (45) days.

E22.2.3 It is noted that certain delays on bridge rehabilitation Work are normal, due to necessary layout and dimensional changes. The Contract Administrator will attempt to resolve the situation as soon as possible. The Contractor is advised that no extension to time will be given for events of this sort which cause construction delay and are resolved within 48 hours of the requirement of change becoming known to both the Contractor and the Contract Administrator.

E22.3 Method of Measurement

E22.3.1 Subject to Clause 22.2 hereof, accelerated completion will be measured on a unit basis per diem. The number of days to be paid for will be the total number of calendar days which the entire facility is safely re-opened to vehicular and pedestrian traffic in advance of the Substantial Completion date of October 15, 2006, specified herein, with all specified Works completed acceptable to the Contract Administrator.

E22.4 Basis of Payment

E22.4.1 Subject to Clause 22.2 hereof, accelerated completion will be paid for at the Unit Price per diem specified hereinafter for “Accelerated Completion” which price shall be payment in full for performing all operations undertaken and all other items incidental to the Work included in this Specification.

Unit Price per diem = $2,000.00

E22.4.2 Payment for this item is not identified on Form B:Prices, and shall not be included thereon. If accelerated completion does occur as specified herein, then payment will be made for this item as an addition to the Contract.

APPENDIX A

REPORT ON PAINT AND SANDBLAST RESULTS
FOR THE REDWOOD BRIDGE REHABILITATION PROJECT