THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 754-2017

TACHE PROMENADE RIVERBANK STABILIZATION, BELVEDERE AND SIDEWALK WIDENING

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 TACHE PROMENADE RIVERBANK STABILIZATION, BELVEDERE AND SIDEWALK WIDENING

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, November 10, 2017.

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

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

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

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

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

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

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

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

B5. CONFIDENTIALITY

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

(a) was known to the Bidder before receipt hereof; or

(b) becomes publicly known other than through the Bidder; or

(c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

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

B6. ADDENDA

B6.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/bidopp.asp

B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B6.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B7. SUBSTITUTES

B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:

(a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;

(b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;

(c) identify any anticipated cost or time savings that may be associated with the substitute;

(d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

(e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B17.

B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

B8.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Bid Security

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

B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.

B8.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.

B8.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B8.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder’s Bid.

B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.

B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B8.8 Bids shall be submitted to:

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

B9. BID

B9.1 The Bidder shall complete Form A: Bid, making all required entries.

B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

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

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

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

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

B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 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/her own name, it shall be signed by the Bidder;

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

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

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

B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B10.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

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

B11. DISCLOSURE

B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full

disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B11.2 The Persons are:

(a) Subterranean MB Ltd.

(b) Borland Construction Ltd.

B12. QUALIFICATION

B12.1 The Bidder shall:

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

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

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

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

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

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

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

(b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and

(c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);

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

(a) written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) or

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program.

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

B12.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B12.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B13. BID SECURITY

B13.1 The Bidder shall provide bid security in the form of:

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

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

(c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B13.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B13.1.2 All signatures on bid securities shall be original.

B13.1.3 The Bidder shall sign the Bid Bond.

B13.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B13.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B13.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B13.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B13.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B13.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

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

B14.1.1 Bidders or their representatives may attend.

B14.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at

The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B14.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B14.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by-law or by City policy or procedures (which may include access by members of City Council).

B15. IRREVOCABLE BID

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

B15.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B16. WITHDRAWAL OF BIDS

B16.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B16.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

B16.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B16.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:

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

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

(c) if the notice has been given by any one of the persons specified in B16.1.3(b), declare the Bid withdrawn.

B16.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B15.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

B17. EVALUATION OF BIDS

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

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

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B7.

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

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

B17.4 Further to B17.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.

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

B18. AWARD OF CONTRACT

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

B18.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B18.2.1 Without limiting the generality of B18.2, the City will have no obligation to award a Contract where:

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

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

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

(d) only one Bid is received; or

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

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

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

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

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

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

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of the stabilization and erosion protection of the existing Tache Avenue riverbank between approximately Rue Despins and Rue Masson, the construction of new pathways, sheet pile, retaining wall and sidewalk widening, treetop lookout structure and associated work.

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

(a) General
  (i) Mobilization;
  (ii) Implement traffic control and management;
  (iii) Protection of existing trees;
  (iv) Construction, re-establishment and removal of temporary access and working platforms;
  (v) Riverbank grading to final grades;
  (vi) Implementation and maintenance of erosion control measures.

(b) Slope Stabilization
  (i) Construct temporary access ramps and working platforms;
  (ii) Drill rockfill column shafts;
  (iii) Supply, place and compact rockfill for rockfill columns;
  (iv) Supply and place rip rap erosion protection;
  (v) Remove temporary access ramps and reshape riverbank;

(c) Upper Bank Pathway
  (i) Construction path tie-ins;
  (ii) Excavation and fill;
  (iii) Construct asphalt pathway including limestone block wall;

(d) Retaining Wall and Sidewalk Widening
  (i) Remove and dispose of existing sidewalk structure including: aluminum handrail and traffic barrier, pavers, concrete curb and pavement, asphalt pavement, reinforced concrete, timber and concrete pile cut-off tops, void forms, steel skirting and embankment fill;
  (ii) Supply and install steel sheet piling;
  (iii) Supply and install subdrain system;
  (iv) Supply and install cellular concrete fill;
  (v) Construct reinforced concrete corbel and abutment seats;
  (vi) Construct concrete pavement and safety curb;
  (vii) Supply and place structural backfill;
  (viii) Construct asphaltic concrete sidewalk pavement structure including pavers;
  (ix) Supply and install aluminum bicycle rail with integral lighting.

(e) Treetop Lookout
  (i) Construct cast-in-place concrete pier foundations including galvanized steel sleeve;

(ii) Supply and install bearings;
(iii) Supply, fabricate and erect galvanized structural steel girders, pier beams and diaphragms;
(iv) Supply and install stay-in-place steel decking;
(v) Supply and install reinforcing steel;
(vi) Construct cast-in-place reinforced concrete deck and curb;
(vii) Supply and install deck expansion joints;
(viii) Install precast concrete pavers including sand bedding and waterproofing membrane;
(ix) Supply, fabricate and install handrail with integral lighting;
(x) Supply, fabricate and install timber bench and railing;
(xi) Install and connect all electrical services.

(f) Landscaping
(i) Pruning of existing trees;
(ii) Supply and installation of shrubs and trees;
(iii) Supply and place planting medium;
(iv) Supply and place sod;
(v) Supply and install site furnishings;
(vi) Landscape maintenance.

(g) Electrical
(i) Supply and install all electrical conduit duct runs;
(ii) Supply and install all wiring, devices and light fixtures;
(iii) Install and connect all electrical services.

D3. DEFINITIONS

D3.1 D3.1 When used in this Bid Opportunity:

(a) ”**API**” means American Petroleum Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(b) ”**ACI**” means the American Concrete Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(c) ”**ASTM**” means the American Society for Testing and Materials that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(d) ”**CSA**” means the Canadian Standards Association that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(e) ”**ICRI**” means the International Concrete Repair Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work

(f) ”**RSIC**” means the Reinforcing Steel Institute of Canada that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work

(g) ”**CGSB**” means the Canadian General Standards Board that complies with the latest edition of standards including amendments and supplements in effect on the date of issue

(h) “Belvedere” means an open sided gallery or architectural structure sited to take advantage of a fine or scenic view. In addition, Belvedere has the same meaning as “Treetop Lookout”.

(i) "Fabricator" means the fabrication company, certified according to CAN/CSA W47.1, Division 1 or 2, undertaking structural steel and miscellaneous metal fabrication.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is Trek Geotechnical, represented by:
Michael Van Helden, Ph.D., P.Eng.
Telephone No. 204 975 9433
Email Address: mvanhelden@trekgeotechnical.ca

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

D4.3 Bids Submissions must be submitted to the address in B8.8.

D5. CONTRACTOR'S SUPERVISOR

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

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

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

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

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

(a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;

(b) the Contract, all deliverables produced or developed; and

(c) any statement of fact or opinion regarding any aspect of the Contract.

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

D7. NOTICES

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

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

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

The City of Winnipeg
Chief Financial Officer

Facsimile No.: 204 949-1174

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

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services

Facsimile No.: 204 947-9155

D7.5 Bids Submissions must be submitted to the address in B8.8.

D8. FURNISHING OF DOCUMENTS

D8.1 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/her at cost.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

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

D10. SAFE WORK PLAN

D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D10.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D10.3 Notwithstanding B12.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

D11.1 The Contractor shall provide and maintain the following insurance coverage:

(a) commercial general liability insurance, in the amount of at least two million dollars ($2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

(b) automobile liability insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than $2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.

(c) an all risk floater carrying adequate limits to cover all equipment, supplies, and/or materials intended to enter into and form part of the installation.

(d) an all risks property insurance policy to cover all equipment and tools that may be owned, rented, leased or borrowed to be used in conjunction with the scope of work.

D11.2 Deductibles shall be borne by the Contractor.

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

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

D11.5 The Contractor shall require each of its sub-contractors to provide comparable insurance to that set forth under D11.1 (a) and (b) above.

D11.6 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D12. PERFORMANCE SECURITY

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

(a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or

(b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or

(c) a certified cheque or draft payable to “The City of Winnipeg”, drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

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

D12.2 If the Bid Security provided in his/her bid was not a certified cheque or draft pursuant to B13.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13. SUBCONTRACTOR LIST

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

D14. EQUIPMENT LIST

D14.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at least two (2) Business

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

D15. DETAILED WORK SCHEDULE

D15.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D15.2 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.

D15.3 Further to D15.2(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, as well as the critical stages identified in D18.

D15.4 Further to D15.2(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.

D15.4.1 Further to D15.2(b), the Gantt chart shall be tracked and submitted bi-weekly, to be viewed and discussed at the construction meetings.

D15.5 Further to D15.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

SCHEDULE OF WORK

D16. COMMENCEMENT

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

D16.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:

(i) evidence of authority to carry on business specified in D9;

(ii) evidence of the workers compensation coverage specified in C6.15;

(iii) the Safe Work Plan specified in D10;

(iv) evidence of the insurance specified in D11;

(v) the performance security specified in D12;

(vi) the Subcontractor list specified in D13;

(vii) the equipment list specified in D14; and.

(viii) the detailed work schedule specified in D15.

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

D16.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D16.4 The City intends to award this Contract by December 1, 2017.

D16.4.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D17. SEQUENCE OF WORK

D17.1 Further to C6.1, the sequence of work shall be as follows:

D17.1.1 The Contractor shall maintain the existing street lighting on Tache Avenue at all times until the proposed street lighting is complete. Any damage caused to the existing street lighting shall be repaired at the Contractor's own cost.

D17.1.2 Placement of net fill for temporary access ramps shall not occur until lower bank working platform widening downslope of the ramp has been partially constructed using a minimum of 4 times the weight of the required net ramp fill, as accepted by the Contract Administrator. Net ramp fill is defined as any additional fill necessary (beyond a balanced cut and fill within the extent of the ramp) to construct the access ramps.

D17.1.3 Rockfill column installation shall commence with 2.1 m diameter rockfill columns at the upstream end of the project site, proceeding in a downstream direction. Installation of 3.0 m diameter rockfill columns shall follow completion of 2.1 m diameter rockfill column installation, unless multiple drill rigs are used.

D17.1.4 Treetop Lookout, Upper-Bank Pathway, Retaining Wall or Sidewalk Widening on-site work shall not commence prior to June 15, 2018, unless approved otherwise by the Contract Administrator.

D17.1.5 Following installation of topsoil on riverbank, the Contractor shall facilitate access by the City of Winnipeg to proceed with seeding prior to planting trees. During or following tree planting of specified trees by the Contractor, the Contractor shall facilitate access by the City of Winnipeg to proceed with planting shrubs and small diameter trees.

D17.1.6 Driving of steel sheet piles shall commence at the Station 1+106.987 bendline and proceed south to completion before proceeding north to completion.

D18. CRITICAL STAGES

D18.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) "Slope Stabilization" as defined in D2.2(b) must be completed by March 15, 2018;

(b) "Landscaping" as defined in D2.2(f) must be complete by August 30, 2018.

(c) Twenty (20) Working Day period of Tache Avenue full closure.

D18.2 The Contractor bears all risk associated with elevated river levels impacting the Contractor's execution of the Work. A hydraulic assessment report including Red River Flood Level Probabilities (including a water level- probability relationship) is available in Appendix 'A'.

D18.3 When the Contractor considers the Work associated with the Critical Stages to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D18.4 The date on which the Critical Stages have been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the Critical Stage has been achieved.

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by October 30, 2018.

D19.2 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.

D19.3 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.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by November 15, 2018.

D20.2 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.

D20.3 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.

D21. LIQUIDATED DAMAGES

D21.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City three thousand dollars ($3,000.00) per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues.

D21.2 The amount specified for liquidated damages in D21 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.

D21.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D22. SCHEDULED MAINTENANCE

D22.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Reflective crack maintenance during two-year maintenance warranty as specified in the latest version of the City of Winnipeg Standard Construction Specification CW 3250.

(b) Crack sealing of the interface of curb and gutter and asphalt pavement shall be completed in accordance with CW 3250 one year after Total Performance has been achieved, unless directed by the Contract Administrator.

(c) Sodding as specified in CW 3510.

(d) Trees, shrubs and ground cover plantings as specified in E42.

(e) Landscape maintenance as specified in E43.

D22.2 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.

D23. RESTRICTED WORK HOURS

D23.1 All Work shall be carried out between the hours of 07:00 and 22:00, Monday to Friday, and between 09:00 and 21:00 on Saturdays, Sundays, Civic, or Public Holidays.

D23.2 No Work shall be performed outside of the hours stated in D23.1 without written permission from the Contract Administrator. Approval will only be granted if it is in the best interests of the City to do so.

D23.3 Further to Clause 3.10 of CW 1130, "Site Requirements", the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed outside the hours outlined in D23.1.

CONTROL OF WORK

D24. JOB MEETINGS

D24.1 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.

D24.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D25. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D25.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D26. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D26.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

D27. WORK BY OTHERS

D27.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) City of Winnipeg Traffic Services Branch – Set up, maintenance, and removal of signage and traffic control.

(b) City of Winnipeg Forestry Branch – Tree planting.

(c) Manitoba Hydro – Relocation and maintenance of street lighting, as required.

(d) City of Winnipeg Naturalist Services – Planting of shrubs and small diameter trees on riverbank.

(e) Contract Administrator – Instrumentation monitoring, repair and/or installation of new riverbank or structure instrumentation, slope stabilization layout and Contractor layout checks.

(f) Any additional unidentified Work if and as necessary.

D27.2 The Contract Administrator will attempt to arrange and coordinate Work to be performed by others so that such Work does not interfere with the Work and Schedule of the Contractor. Where Work by others interferes, as determined by the Contract Administrator, with the Contractor's planned Work, the Contractor shall modify his plans and do other Work. Unless the Contract Administrator determines that there was no opportunity for the Contractor to do a similar amount of Work, no consideration will be made to extending the Contract time.

D28. COOPERATION WITH OTHERS

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

D29. AUTHORIZED WORK ON PRIVATE PROPERTY

D29.1 The Contractor shall confine his Works to the right-of-way or easements as much as possible. Where Work is required to be done on or accessed through private property, the Contractor shall obtain written permission from the property owner and provide a copy to the Contract Administrator.

D30. ENCROACHMENT ON PRIVATE PROPERTY

D30.1 Further to Section 3.11 of CW 3110 of the General Requirements, the Contractor shall confine his Work to the public right-of-ways and construction easements at all times, except if he has received written permission from the property owner. The Contractor shall provide the Contract Administrator with a copy of any written permission he has received to enter onto private property.

D30.2 The Contractor's construction activities shall be confined to the minimum area necessary for undertaking the Work and he shall be responsible for all damage to private property resulting from his Work. Particular care shall be taken to assure no damage is done to buildings, fencing, trees and plants, and provision shall be made to maintain full drainage for private properties during construction.

D31. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D31.1 Further to Section 3.13 of CW 1130 of the General Requirements, special care shall be taken to avoid damage to existing adjacent structures and properties during the course of Work.

D31.2 Any damage caused by the Contractor or his Subcontractors to the adjacent structures of properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

D32. LAYOUT OF WORK

D32.1 Further to C6, the Contract Administrator shall layout the slope stabilization work as defined in Clause D2.2(b) and will provide the basic centerline and a benchmark for construction of all other Work.

D32.2 The Contractor shall be responsible for the true and proper laying out of all aspects of the Work except for the slope stabilization work and shall provide all required instruments and competent personnel for performing the layouts.

D32.3 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at their discretion.

D32.4 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at their own expense.

D32.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

D33. CONTRACTOR LIGHTING DURING CONSTRUCTION

D33.1 The Contractor shall not apply direct lighting to any nearby residential buildings for the construction of the Work.

D33.2 The Contract Administrator will attempt to arrange and coordinate Work to be performed by others so that such Work does not interfere with the Work and Schedule of the Contractor. Where Work by others interferes, as determined by the Contract Administrator, with the Contractor's planned Work, the Contractor shall modify his plans and do other Work. Unless the Contract Administrator determines that there was no opportunity for the Contractor to do a similar amount of Work, no consideration will be made to extending the Contract time.

D34. ENVIRONMENTAL PROTECTION PLAN

D34.1 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.

D34.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal
  (i) Canadian Environmental Assessment Act (CEAA), 1992 c.37;
  (ii) Canadian Environmental Protection Act;
  (iii) Fisheries Act, 1985 c.F-14;
  (iv) Transportation of Dangerous Goods Act and Regulations, c.34;
  (v) Migratory Birds Convention Act and Regulations, c.22;
  (vi) Species at Risk Act, c.29;
  (vii) Transportation Association of Canada's Transportation Association of Canada *National Guide to Erosion and Sediment Control on Roadway Projects*, 2005;
  (viii) Applicable Fisheries and Oceans Canada Operational Statements for Manitoba for Temporary Stream Crossings;
  (ix) The Department of Fisheries and Oceans *Freshwater Intake End-of-Pipe Fish Screen Guidelines*, DFO 1995;
  (x) Fisheries and Oceans Policy for the *Management of Fish Habitat* 1986;
  (xi) Federal Policy on Wetland Conservation 1991;
  (xii) Navigable Waters Best Practices; and
  (xiii) Any other applicable Acts, Regulations, and By-laws.

(b) Provincial
  (i) The Dangerous Goods Handling and Transportation Act, D12;
  (ii) The Endangered Species Act, c.E111;
  (iii) The Environment Act, c.E125;
  (iv) The Fire Prevention Act, c.F80;
  (v) The Heritage Resources Act, c.H39.1;
  (vi) The Noxious Weeds Act , c.N110;
  (vii) The Nuisance Act, c.N120;

(viii) The Pesticides Regulation, M.R. 94/88R
(ix) The Public Health Act, c.P210;
(x) The Water Protection Act, c.W65;
(xi) The Workplace Safety and Health Act c.W210;
(xii) Current applicable Associated Regulations;
(xiii) The Manitoba Stream Crossing Guidelines for the *Protection of Fish and Fish Habitat, Manitoba National Resources*, 1996.; and
(xiv) Any other applicable Acts, Regulations, and By-laws.

(c) Municipal
(i) The City of Winnipeg Neighbourhood Liveability By-law No. 1/2008;
(ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000;
(iii) City of Winnipeg *Best Management Practices for Activities In and Around the City's Waterways and Watercourses*, City of Winnipeg 2005;
(iv) The City of Winnipeg *Motor Vehicle Noise Policies and Guidelines*;
(v) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000;
(vi) The City of Winnipeg By-law No. 92/2010;
(vii) The City of Winnipeg By-law No. 5888/92; and
(viii) Any other applicable Acts, Regulations, and By-laws.

D34.3 Applications for a City of Winnipeg Waterways permit and DFO Authorization permit are currently underway for this Work. The permits shall be provided to the Contractor when they are formally issued. The Contractor shall comply with the requirements outlined in the permits.

D34.4 Work shall be undertaken with consideration of the measures outlined in Transport Canada's letter 2017-600053 dated August 29, 2017. This letter is included as Appendix B.

D34.5 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage
(i) Storage on construction materials shall be confined to the defined laydown areas as shown on the Contract Drawings or at a location approved by the Contract Administrator.
(ii) Construction materials shall not be deposited or stored on or near watercourses unless written acceptance from the Contract Administrator is received in advance.
(iii) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.
(iv) Construction materials and debris shall be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

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

(iv) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervi8ous 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 battier 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) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.

(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) The deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act, 1985. The Contractor shall take appropriate precautions to ensure that potentially deleterious substances (such as fuel, hydraulic fluids, oil, sediment, etc.) do not enter any water body.

(xi) 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.

(xii) Machinery shall arrive on Site in a clean condition and shall be maintained to be free to fluid leaks.

(xiii) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available upon short notice. Additionally, appropriate staff on Site shall be trained for proper handling of deleterious liquids (i.e. fueling) and trained in preventing and cleaning up minor spills.

(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) On Site volumes of sewage and/or septage will be removed on a weekly basis.

(v) The Contractor shall ensure sewage, septage, and other liquid wastes generated on Site are handled and disposed of by a certified disposal contractor.

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

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

(viii) Structurally unsuitable site excavation material will be removed by the Contractor.

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

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

(xi) 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.

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

(xiii) The Contractor shall notify and receive written approval from the Contract Administrator prior to discharge from any dewatered areas. The discharge will be released into a well-vegetated area, filter bag, settling basin, or storm sewer system to remove the suspended material and other deleterious substances from the discharge before it finds its way into any watercourse. Discharge from dewatering areas may require approved disposal via the sanitary sewer system or disposal truck in accordance with Construction Specifications, at the request of the Contract Administrator.

(xiv) Flows will be dissipated so that dewatering discharges minimize erosion at the discharge point.

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

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

(iv) Different waste streams shall not be mixed.

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

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

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

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

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

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

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

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

(e) Emergency Response

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

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

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

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

(i) Notify emergency-response coordinator of the accident:

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

(ii) Attend to public safety:

- Stop traffic, roadblock/cordon off the immediate danger area;
- Eliminate ignition sources;
- Initiate evacuation procedures if necessary.

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

- Personnel on Site;
- Cause and effect of spill;
- Estimated extent of damage;
- Amount and type of material involved; and
- Proximity to waterways, sewers, and manholes.

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

- Approach from upwind;
- Stop or reduce leak if safe to do so;
- Dyke spill material with dry, inert absorbent material or dry clay soil or sand;
- Prevent spill material from entering waterways and utilities by dyking;
- Prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking; and
- Resume any effective action to contain, clean up, or stop the flow of the spilled product.

(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 within-house resources without formal notification to Manitoba Environment.

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

TABLE 1 SPILLS THAT MUST BE REPORTED TO MANITOBA SUSTAINABLE DEVELOPMENT 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	K kg or 1 L
PG** III	Oxidizer	50 kg or 50 L
5.2	Organic Peroxide	1 kg or 1 L
6.1 PG** I & II	Acute Toxic	1 kg or 1 L
PG** III	Acute Toxic	5 kg or 5 L
6.2	Infectious	All
7	Radioactive	Any discharge or radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface
8	Corrosive	5 kg or 5 L
9.1	Miscellaneous (except PCB mixtures)	50 kg
9.2	PCB Mixtures	500 g
9.3	Aquatic Toxic	1 kg or 1 L
9.4	Wastes (chronic toxic)	5 kg or 5 L
* Container capacity (refers to container water capacity) ** PG = Packing Group(s)		

(f) Noise and Vibration

(i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, unless otherwise accepted in advance by the Contract Administrator. The activities will generally be restricted to 7:00 a.m. to 7:00 p.m. weekdays with written permission of the Contract Administrator and the City of Winnipeg for any afterhours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities.

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

(iii) The Contractor shall locate stationary noise generating equipment (i.e. generators) away from sensitive receptors and wildlife areas.

(iv) Construction vehicles and equipment will adhere to posted speed limits.

(g) Dust and Emissions

(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) The Contractor shall minimize construction equipment idling times and turn off machinery, when feasible.

(iii) Dust control practices implemented by the Contractor during construction will 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.

(iv) 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.

(v) 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.

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

(h) Erosion Control

(i) The Contractor shall develop a sediment control plan prior to beginning construction in adherence to the Transportation Association of Canada National Guide to Erosion and Sediment Control on Roadway Projects, the City of Winnipeg's *Best Management Practices for Activities In and Around the City's Waterways and Watercourses*, and to the satisfaction of the Contract Administrator.

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

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

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

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

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

(vii) The Contractor shall routinely inspect all erosion and sediment control structures and immediately carry out any necessary maintenance. Several inspections will be performed during rainy days.

(viii) Construction activities will be avoided during periods of high winds to prevent erosion and the creation of dust.

(i) Runoff Control

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

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

(iii) Construction activities on erodible slopes shall be avoided during spring runoff and heavy rain fall events.

(j) Fish

(i) Due to the presence of spawning fish species no instream works will occur between April 1 and June 15 of any given year.

(ii) A buffer of vegetation will be maintained when working along waterways, where possible.

(iii) The duration of Work and amount of disturbance to the bed and banks of the waterbody will be minimized.

(k) Wildlife

(i) No clearing of trees, shrubs, or vegetation is permitted between May 1 and July 31 of any year to protect the nesting and breeding season for migratory birds and other wildlife, unless otherwise identified by a Project biologist.

(ii) No disruption, movement, or destruction shall occur to any migratory bird nests.

(iii) In the event that a species at risk or a nest is encountered during construction, all Work will cease in the immediate area, the site will be made safe, and the Contract Administrator shall be contacted for further direction.

(l) 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) The Contractor will limit the removal of trees and snags (standing dead trees), surface disturbance, and vegetation clearing.

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

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

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

(vii) 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 practice by bonded tree care professionals.

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

(m) 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 on City Streets of The City of Winnipeg, Public Works Department.

(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.

(n) Access

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

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

MEASUREMENT AND PAYMENT

D35. PAYMENT

D35.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

D36. PAYMENT SCHEDULE

D36.1 Further to C12, payment shall be in accordance with the following payment schedule:

(a) All portions of Work including those designated for Lump Sum payment will be paid for on a monthly pro-rata basis as determined by the Contract Administrator in consultation with the Contractor provided the portion of the Work to be paid for has been permanently incorporated into the Works, unless otherwise specified.

WARRANTY

D37. WARRANTY

D37.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D37.2 Notwithstanding C13.2 or D36.1, 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.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

BID OPPORTUNITY NO. 754-2017

TACHE PROMENADE RIVERBANK STABILIZATION, BELVEDERE AND SIDEWALK WIDENING

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

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

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 754-2017

TACHE PROMENADE RIVERBANK STABILIZATION, BELVEDERE AND SIDEWALK WIDENING

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

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

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D13)

TACHE PROMENADE RIVERBANK STABILIZATION, BELVEDERE AND SIDEWALK WIDENING

Name	Address

FORM K: EQUIPMENT
(See D14)

Tache Promenade Riverbank Stabilization, Belvedere and Sidewalk Widening

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 D14)

Tache Promenade Riverbank Stabilization, Belvedere and Sidewalk Widening

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: _____

FORM K: EQUIPMENT
(See D14)

Tache Promenade Riverbank Stabilization, Belvedere and Sidewalk Widening

7. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

8. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

9. 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 D14)

Tache Promenade Riverbank Stabilization, Belvedere and Sidewalk Widening

10. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

11. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

12. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

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

E1.3 The following are applicable to the Work:

Drawing Index:

Sheet No.	City Drawing No.	Sheet Title
00	B250-17-00	Cover Sheet & Location Plan
01	B250-17-01	Drawing Index
		General Scope of Work
02	B250-17-02	General Scope of Work – Plan
03	B250-17-03	Traffic Control & Construction Staging – Stage 1
04	B250-17-04	Traffic Control & Construction Staging – Stage 2 & 3
		Existing Conditions
05	B250-17-05	Existing Conditions – Rue Despins to Sta 0+820
06	B250-17-06	Existing Conditions – Sta 0+820 to Sta 0+930
07	B250-17-07	Existing Conditions – Sta 0+930 to Sta 1+050
08	B250-17-08	Existing Conditions – Sta 1+050 to Rue Masson
		Slope Stabilization
09	B250-17-09	Temporary Access & Work Platforms – Plan
10	B250-17-10	Temporary Access & Work Platforms – Profiles
11	B250-17-11	Temporary Access & Work Platforms – Sections
12	B250-17-12	Stabilization Works – Plan – Rue Despins to Sta 0+860
13	B250-17-13	Stabilization Works – Plan – Sta 0+860 to Sta 1+020
14	B250-17-14	Stabilization Works – Plan – Sta 1+020 to Rue Masson
		Upper Bank Pathway
15	B250-17-15	Upper Bank Pathway – Plan Profile & Section – Sta 0+070 to Sta 0+180
16	B250-17-16	Upper Bank Pathway – Plan Profile & Section – Sta 0+180 to Sta 0+280
		Retaining Wall and Sidewalk Widening
17	B250-17-17	General Notes and Design Data
18	B250-17-18	Sidewalk Widening – Plan Profile & Section – Rue Despins to Sta 0+840
19	B250-17-19	Sidewalk Widening – Plan Profile & Section – Sta 0+840 to Sta 0+960
20	B250-17-20	Sheet Pile Wall – Plan and Profile
21	B250-17-21	Sheet Pile Wall – Corbel and Sheet Pile Detail
22	B250-17-22	Sheet Pile Wall – Corbel and Sheet Pile Detail 2
23	B250-17-23	Sheet Pile Wall – Corbel and Sheet Pile Wall Elevation
24	B250-17-24	Sheet Pile Wall – Handrail Details 1
25	B250-17-25	Sheet Pile Wall – Handrail Details 2
26	B250-17-26	Sheet Pile Wall – Bill of Steel Reinforcement and Material
		Treetop Lookout
27	B250-17-27	General Notes and Design Data
28	B250-17-28	General Arrangement
29	B250-17-29	Control Geometry

30	B250-17-30	Borehole Logs
31	B250-17-31	Foundation 1
32	B250-17-32	Foundation 2
33	B250-17-33	SU2 and SU9 Pier Caps
34	B250-17-34	Bearing Details 1
35	B250-17-35	Bearing Details 2
36	B250-17-36	Framing Plan
37	B250-17-37	Pier Beam Details
38	B250-17-38	Girders & Diaphragms 1
39	B250-17-39	Girders & Diaphragms 2
40	B250-17-40	Girders & Diaphragms 3
41	B250-17-41	Girders & Diaphragms 4
42	B250-17-42	Deck Plan
43	B250-17-43	Deck Plan - Drainage
44	B250-17-44	Deck Reinforcing Plan
45	B250-17-45	Deck Reinforcing Details
46	B250-17-46	Expansion Joint Details
47	B250-17-47	South Jump Slab – Concrete and Reinforcing Details
48	B250-17-48	North Jump Slab – Concrete and Reinforcing Details
49	B250-17-49	Handrail Plan
50	B250-17-50	Handrail Details 1
51	B250-17-51	Handrail Details 2
52	B250-17-52	Handrail Details 3
53	B250-17-53	Transition Rail Details 1
54	B250-17-54	Transition Rail Details 2
55	B250-17-55	Lookout Platform Bench & Rail 1
56	B250-17-56	Lookout Platform Bench & Rail 2
57	B250-17-57	Bill of Steel Reinforcing 1
58	B250-17-58	Bill of Steel Reinforcing 2
		Landscaping
59	B250-17-59	Tree Removal and Protection Plan
60	B250-17-60	Tree Removal and Protection Plan
61	B250-17-61	Tree Removal and Protection Plan
62	B250-17-62	Materials and Planting Plan
63	B250-17-63	Materials and Planting Plan
64	B250-17-64	Materials and Planting Plan
65	B250-17-65	Belvedere Paving Plan
66	B250-17-66	Hardscape Details
67	B250-17-67	Hardscape & Softscape Details
		Electrical
68	B250-17-68	Artwork Electrical Connection
69	B250-17-69	Site Plan Electrical Connection
70	B250-17-70	Promenade and Belvedere Electrical

E2. GEOTECHNICAL INVESTIGATION

E2.1 Further to C3.1, geotechnical reports by Trek Geotechnical are included as Appendix C to aid the bidder's evaluation of the existing soil conditions during the tender period. Borehole logs are also provided on the Drawings. Bidders may view other historical reports during the tender period by contacting the Contract Administrator identified in D3.

GENERAL REQUIREMENTS

E3. SHOP DRAWINGS

E3.1 Description

(a) This Specification provides instructions for the preparation and submission of Shop Drawings. The term 'Shop Drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, including Site erection drawings which are to be provided by the Contractor to illustrate details of a portion of the Work.

(b) Further to C6.9, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract, or as reasonably required by the Contract Administrator.

(c) The Contractor shall submit to the Contract Administrator for review, all specified Shop Drawings. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for the Contract Administrator's review.

E3.2 Shop Drawings

(a) Original drawings shall be prepared by the Contractor, to illustrate the appropriate portion of Work including fabrication, layout, setting, or erection details as specified in the appropriate sections.

(b) Shop Drawings shall bear the seal of a Professional Engineer licensed to practice in the province of Manitoba.

(c) Shop Drawings shall be prepared by the Contractor.

E3.3 Contractor's Responsibilities

(a) Review Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements

(b) Verify:

(i) Field Measurements;

(ii) Field Construction Criteria; and

(iii) Catalogue numbers and similar data.

(c) Coordinate each submission with requirement of Work and Contract Documents. Individual Shop Drawings will not be reviewed until all related drawings are available.

(d) Promptly submit Shop Drawings in an orderly sequence to prevent delay in the Work or the Work of other Contractors.

(e) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

(f) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.

(g) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

(h) Make any corrections required by the Contract Administrator and resubmit the required number of corrected copies of Shop Drawings. Direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

(i) After Contract Administrator's review and return of copies, distribute copies to Subcontractors and others as appropriate.

(j) Maintain one (1) complete set of reviewed Shop Drawings, filed by Specification Section Number, at the Site of the Work for use and reference of the Contract Administrator and Subcontractors.

E3.4 Submission Requirements

(a) Allow for a ten (10) Business Day period for review by the Contract Administrator of each individual submission and re-submission, unless otherwise noted in the Contract Documents.

(b) Accompany submissions with transmittal letter containing:
  (i) Date;
  (ii) Project title and Bid Opportunity number;
  (iii) Contractor's name and address;
  (iv) Number of each Shop Drawing, product data and sample submitted;
  (v) Specification Section, Title, Number, and Clause;
  (vi) Drawing Number and Detail/Section Number; and
  (vii) Other pertinent data.

(c) Submissions shall include:
  (i) Date and revision dates; and
  (ii) Project title and Bid Opportunity number.

(d) Name of:
  (i) Contract;
  (ii) Subcontractor;
  (iii) Supplier;
  (iv) Manufacturer;
  (v) Detailer (if applicable);
  (vi) Identification of product or material;
  (vii) Relation to adjacent structure or materials;
  (viii) Field dimensions, clearly identified as such;
  (ix) Specification section name, number, and clause number or drawing number and detail/section number;
  (x) Applicable standard, such as CSA or CGSB numbers; and
  (xi) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

E3.5 Other Considerations

(a) Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

(b) Material and equipment delivered to the Site of the Works will not be paid for at least until pertinent Shop Drawings have been submitted and reviewed.

(c) Incomplete Shop Drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

(d) No delay or cost claims will be allowed that arise because of delays in submissions, resubmissions, and review of the Shop Drawings.

E4. VERIFICATION OF WEIGHT

E4.1 Weight Verification

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

(b) 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.

(c) 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:

(i) Checking Contractor's scales for Consumer & Corporate Affairs certification seals;

(ii) Observing weighing procedures;

(iii) Random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale; and Checking tare weights shown on delivery tickets against a current tare.

(d) No charge shall be made to the City for any delays or loss of production caused by such inspection and verification.

E4.2 Evaluation of Tare Weight

(a) 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.

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

(i) Upon which scale the truck or truck/trailer(s) combination was weighed;

(ii) The mechanically printed tare weight;

(iii) The license number(s) of the truck and trailer(s); and

(iv) The time and date of weighing.

E5. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

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

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

E5.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) CW 3550 – Chain Link and Drift Control Fence.

E5.3 Scope of Work

(a) The Work under this Specification shall include but not be limited to:

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

(ii) Supplying, setting up, laying out, and removing site office facilities as detailed in E6 "Site Office Facilities";

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

(iv) Maintaining and removing any access roadways; and

(v) Restoring all existing facilities.

E5.4 Materials

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

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

E5.5 Equipment

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

E5.6 Construction Methods

E5.6.1 Layout of On-Site Work Facilities

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

(b) Possible locations for the Contractor's staging areas include the Tache Avenue right-of-way southbound lane when staged closed. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas.

(c) Upon completion of construction activities, the Contractor shall remove all on-site Work and other temporary facilities, and restore to pre-existing conditions.

E5.6.2 Cellular Telephone Communication

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

E5.6.3 Secure Site Fencing

(a) A minimum 1.8 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7 "Substitutes", secure fence around the site laydown and Work site areas shall be installed prior to commencement of site activities.

(b) A minimum 1.25 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7 "Substitutes", secure fence for work on or adjacent to private property where easements or permissions have been obtained.

(c) During winter months, a minimum 1.2 m high snow fence shall be installed on the river ice.

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

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

E5.6.4 Traffic Gates

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

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

E5.6.5 Access Roadway

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

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

(c) City of Winnipeg streets and alleys adjacent to all access roads and staging areas must be kept clean at all times.

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

E5.6.6 Restoration of Existing Facilities

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

E5.7 Quality Control

E5.7.1 Inspection

(a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator

including all operations from the selection and production of materials through to final acceptance of the specified Work.

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E5.7.2 Access

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

E5.8 Measurement and Payment

E5.8.1 Mobilization and Demobilization

(a) Mobilization and demobilization shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", 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 and accepted by the Contract Administrator.

E5.8.2 Mobilization and demobilization will be paid for at a percentage of the Contract Lump Sum Price for “Mobilization and Demobilization” specified as follows:

(a) 30% when the Contract Administrator is satisfied that construction has commenced;

(b) 60% during construction;

(c) 10% upon completion of the Work.

E6. SITE OFFICE FACILITIES

E6.1 Description

(a) This Specification shall cover all operations relating to the supply of site office facilities, as specified herein.

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

E6.2 Materials

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

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

E6.3 Equipment

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

E6.4 Construction Methods

E6.4.1 Site Office Facilities

(a) The Contractor shall supply the Contract Administrator’s site office facilities meeting the following requirements:

(i) A site office shall be provided for the exclusive use of the Contract Administrator;

(ii) The office shall be conveniently located within the site lay-down area near the Work site;

(iii) The office shall be a newer building with a minimum floor area of 15 square metres, having a ceiling height of 2.4 m and adequate windows (complete with security bars) to provide for cross ventilation, with door entrance(s) with suitable lock(s);

(iv) The office shall be suitable for all weather use. It shall be equipped with suitable heating and air conditioning systems, so that the interior room temperature can be maintained between 20 to 22ºC at any outside ambient temperature;

(v) The office shall be adequately lighted with fluorescent fixtures and have a minimum of ten – 120 volt ac electrical receptacles;

(vi) The office shall be furnished with one office desk and two chairs, one drafting table, one meeting table, one stool, one legal size filing cabinet, two bookcases, and a minimum of eight (8) chairs;

(vii) The office shall be equipped with reliable internet access, supplied and paid for by the Contractor, either provided by Ethernet cable (hard line) or wireless internet service. Any wireless internet access shall be secured by an access password and by conventional WPA2 256-bit encryption to prevent unauthorized access. If wireless internet access is not provided, then a minimum of two Ethernet connections shall be provided.

(viii) One refrigerator, approximately 5 ft3 and one mid-size microwave shall be supplied by the Contractor;

(ix) A bottled water supply, with associated consumables, shall be supplied fresh regularly by the Contractor;

(x) A portable flush or chemical-type toilet, lavatory, and mirror shall be located near the site office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and personnel from the City;

(xi) The site office building and the portable toilet shall be cleaned on a weekly basis. The Contract Administrator may request additional cleaning when he deems it necessary;

(xii) A minimum of three parking stalls shall be made available for use by the Contract Administrator immediately adjacent to the site office; and

(xiii) All site office facilities and furnishings shall be approved by the Contract Administrator;

(b) The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the site office facilities.

(c) The site office facilities shall be provided from the date of the commencement of the Work to the date of Total Performance unless otherwise approved in writing by the Contract Administrator.

E6.5 Measurement and Payment

E6.5.1 Site Office Facilities

(a) The supply of site office facilities shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work, included in this Specification and accepted by the Contract Administrator.

E7. TRAFFIC CONTROL

E7.1 Further to Clauses 3.6, 3.7 and 3.8 of CW1130:

(a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and

planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.

(b) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or subcontractor.

E7.2 Notwithstanding E7.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the **Traffic Services Branch of the City of Winnipeg** to place, maintain, and remove all **regulatory signs** and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

(a) Parking restrictions,

(b) Stopping restrictions,

(c) Turn restrictions,

(d) Diamond lane removal,

(e) Full or directional closures on a Regional Street,

(f) Traffic routed across a median,

(g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.

(h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

E7.2.1 An exception to E7.2 is the 'KEEP RIGHT/KEEP LEFT' sign (RB-25 / RB-25L) which shall be supplied, installed, and maintained by the Contractor at their own expense.

E7.2.2 Further to E7.2, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E8. TRAFFIC MANAGEMENT

E8.1 Further to clause 3.7 of CW 1130:

E8.1.1 The Contractor shall schedule construction activities to meet the following:

(a) During riverbank stabilization works (Commencement of the Work until March 15, 2018), a minimum of one lane of northbound traffic shall be maintained along Tache Avenue between Rue Despins and Provencher Boulevard at all times during construction. When no work is being performed on site, non-essential lane closures will not be permitted. Flag persons shall be present at the entrance and exit of access ramps whenever they are actively being used.

(i) No lane closures will be permitted from February 16 to February 25, 2018, inclusive.

(b) In accordance with Sequence of Work, the Contractor shall not be permitted to close any lanes to traffic on Tache Avenue between March 15, 2018 and June 15, 2018.

(c) From June 15, 2018 until Total Performance, a minimum of one lane of northbound traffic shall be maintained along Tache Avenue between Rue Despins and Avenue de la Cathedrale at all times during construction. When no work is being performed on site and it is safe to open the lane, non-essential lane closures will not be permitted.

(i) Tache Avenue between Rue Despins and Avenue de la Cathedrale will be permitted to be fully closed to traffic, in stages to maintain access to residence

or businesses, to facilitate steel sheet pile installation only for a maximum of twenty (20) Working Day period.

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

E8.1.2 Should the Contractor be unable to maintain an existing access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E8.1.3 Pedestrian and ambulance/emergency vehicle access must be maintained at all times.

E8.2 Measurement and Payment

E8.2.1 Traffic management shall not be measured. This item of work shall be paid for on a Lump Sum Price for "Traffic Management", which price will be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E8.2.2 Traffic Management will be paid for at a percentage of the Contract Lump Sum Price for "Traffic Management" specified as follows:

(a) 30% when the Contract Administrator is satisfied that construction has commenced;

(b) 60% during construction;

(c) 10% upon completion of the Work.

E9. REFUSE AND RECYCLING COLLECTION

E9.1 While access to refuse and/or recycling collection vehicles is restricted, on collection day(s) the Contractor shall move all of the affected property owners refuse and/or recycling materials to a nearby common area to permit the normal collection vehicles to collect the materials. Immediately following recycling collection, the Contractor shall return refuse and/or recycling receptacles to the addresses marked on the receptacles.

E9.2 No measurement or payment will be made for the work associated with this Specification.

E10. WATER OBTAINED FROM THE CITY

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

E11. SURFACE RESTORATIONS

E11.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E12. PROTECTION OF INSTRUMENTATION

E12.1 The Contractor is advised that geotechnical instrumentation (slope inclinometers and piezometers) have been installed in test holes as shown on the Drawings. During the course of the Work, the Contract Administrator will install additional instrumentation to monitor riverbank and structure performance.

E12.2 The Contractor shall take necessary precautions to prevent damage to the existing or any newly installed geotechnical instrumentation as a result of their Work, as shown on the Drawings.

(a) TH14-01 is within the limits of rockfill columns and shall be located by the Contractor prior to commencement of rockfill column installation. The Contract Administrator shall cut off the instruments below grade and provide a temporary cover plate for use during construction. Following completion of riverbank stabilization, the Contractor shall facilitate instrument repair by the Contract Administrator to permit continued use of the instruments.

(b) Other geotechnical instrumentation installations are near the location of temporary access ramps or platforms and shall be protected. Should abandonment be necessary to perform the Work, the Contractor shall confirm that all reasonable strategies to preserve the instrumentation have been exhausted, and notify the Contract Administrator for acceptance prior to abandonment as temporary modifications to instruments may be possible for preservation and long-term (post-construction) use.

E12.3 The Contractor shall facilitate any work by others necessary to modify existing instrumentation, to maintain operation of the instrumentation or to install new instrumentation.

E12.4 The Contractor shall repair or replace instrumentation damaged as a result of his Work at no cost to the City.

E12.5 The Contractor is advised that monitoring of geotechnical instrumentation will be undertaken by the Contract Administrator during construction. Every effort will be made to schedule monitoring to avoid interruptions of the Contractor's work activities, however it may be necessary to temporarily suspend operation of equipment to reduce ground vibrations during monitoring.

E12.6 No measurement or payment will be made for the work of this Specification.

E13. WATERWAY BY-LAW AND PERMITS

E13.1 The Contractor shall note that all Works fall within 107 metres (350 feet) of the regulated summer water level of the Red River and are therefore within the regulated area of the City pursuant to Waterway By-Law 5888/92. The Contract Administrator will apply and pay for the required Waterway Permits for the Work. The Contractor shall make himself aware of and adhere to all conditions imposed by the permits.

E13.2 Under no circumstances will stockpiling of any material be permitted within 107 metres of the regulated summer water level of the Red River without the approval of the Contract Administrator.

E13.3 The acceptable temporary access ramps and platforms shown on the Drawings are included in the Waterways Permit obtained by the City of Winnipeg for the project. Any modifications to the limits or grades proposed by the Contractor may be subject to an additional or amended permit, as specified in E16 "Site Development".

E14. PROTECTION OF EXISTING TREES

E14.1 Description

(a) This Specification shall cover all operations relating to the protection of existing riverbank and boulevard trees during construction.

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

E14.2 Materials

E14.2.1 Galvanized chain link fencing to City of Winnipeg Standard Specification CW 3550.

E14.3 Construction Methods

E14.3.1 The Contractor will field-verify the presumed limits of work indicated on the Drawings, and flag all trees that require pruning or removal to facilitate the Work, subject to the Contract Administrator's approval. Above ground clearance for overhanging branches in the work zone must be anticipated. No trees may be removed or pruned without written approval from the Contract Administrator.

E14.3.2 Trees within or adjacent to a construction area that are not approved for removal by the Contract Administrator must be protected during construction by means of a barrier surrounding a "Tree Protection Zone" (TPZ) as outlined in E14.3.7.

E14.3.3 Activities which are likely to injure or destroy the tree are not permitted within the TPZ.

E14.3.4 Tree pruning or root pruning of City of Winnipeg owned trees may only be done by a Contractor approved by the project's certified arborist or Urban Forestry Branch.

E14.3.5 No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.

E14.3.6 No City of Winnipeg tree or tree protected by a City of Winnipeg by-law may be removed without the written permission of the City of Winnipeg.

E14.3.7 Tree Protection Zone

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

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

Table 1 – Tree Protection Zones

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

E14.3.8 Tree Protection Barriers

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

(b) The required barrier is a 1.8 metre (6 ft) chain link fencing supported by 50mm dia. galvanized steel posts driven min. 600mm below grade, or as directed by the City of Winnipeg Urban Forestry Branch.

(c) Tree strapping material will be installed on individual trees, in accordance with CW1140, where Work will be completed within the TPZ.

(d) Tree protection barriers are to be erected prior to the commencement of any construction or grading activities on the site and are to remain in place throughout the entire duration of any adjacent work. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place. Tree protection barriers shall be removed prior to spring Red

River flooding and re-established in areas of future adjacent work following the flood recession.

(e) All supports and bracing used to safely secure the barrier should be located outside the TPZ. All supports and bracing should minimize damage to roots.

(f) No grade change, storage of materials or equipment is permitted within this area. The tree protection barrier must not be removed without the written authorization of the City of Winnipeg.

E14.3.9 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing trees:

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

(b) Where authorized, operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the Work equired. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.

(c) Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Contact the Forestry Branch for consultation on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.

E14.3.10 Root Protection, Cutting and Care

(a) Avoid cutting roots. If root cutting appears to be necessary, obtain approval from the Contract Administrator before proceeding. If required and approved, root pruning must be performed under the direction of the Forestry Branch.

(b) Cut roots cleanly with sharp, sterilized hand tools to promote quick wound closure and regeneration.

(c) Minimize damage by avoiding excavation during hot, dry weather.

(d) Keep protected plants well watered before and after digging.

(e) Cover exposed roots with approved temporary root cover material such as soil, mulch, or damp burlap immediately after exposure. Temporary root covers shall be kept damp as long as they are in place.

E14.3.11 American elm trees are not to be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.

E14.3.12 All damage to existing trees caused by the Contractor’s activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist licence or by the Forestry Branch.

E14.3.13 The Forestry Branch will remove and replace any trees deemed to have died or that are dying due to damage from carelessness during construction. Removal and replacement costs will be determined by size, market price of the largest transplantable tree of same or different species and may include appraised value of existing tree as determined by current International Society of Arboriculture evaluation procedure presently used by Forestry Branch in conjunction with City Claims Branch. Estimated replacement cost of a 250 and 600mm diameter American elm on a boulevard based on an appraised value is approximately $4,700.00 and $27,000.00 respectively.

E14.4 Measurement and Payment

E14.4.1 Protection of existing trees shall not be measured. This Item of Work shall be paid for at the Contract Lump Sum price for "Tree Protection," which price will be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E15. PEDESTRIAN SAFETY

E15.1 The pedestrian sidewalk along the west side of Tache Avenue shall be closed during construction in accordance with the Manual of Temporary Traffic Control. Signage shall be installed directing pedestrians to use the east side of Tache Avenue.

E15.1.1 The pedestrian crossing of Tache Avenue at Avenue de la Cathedrale shall be maintained at times all lanes are open to construction during construction.

E15.2 During the project, a temporary snow fence shall be installed and maintained around any excavations, steep drop-offs, access ramps or other conditions hazardous to pedestrians.

E15.3 A fence and appropriate signs shall be placed as required for pedestrian safety, as deemed by the Contract Administrator, during non- working hours to discourage public access to the Site.

E15.4 Pedestrian safety will be considered incidental to Traffic Management and no additional measurement or payment will be made for work described in this specification.

E16. SITE DEVELOPMENT

E16.1 Description

E16.1.1 This Specification shall cover the following Site development items:

(a) Construction of temporary access ramps and working platforms to undertake work for Slope Stabilization.

(b) Removal of existing trees, shrubs, temporary access ramps and working platforms prior to the spring flood.

(c) Re-establishment of temporary access as required to undertake work for Upper Bank Pathway, Retaining Wall and Sidewalk Widening, and Treetop Lookout and Landscaping.

(d) Final removal of temporary access ramps and working platforms and regrading to pre-construction riverbank grades.

E16.1.2 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 other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E16.1.3 This Specification shall supplement CW3170 and CW3010, and the City of Winnipeg "Tree Removal Guidelines".

E16.1.4 The Contractor shall be responsible to develop and maintain Site Access.

E16.2 Submittals

E16.2.1 Site Access Plan

(a) At least five (5) days prior to commencement of construction, the Contractor shall submit a Site Access Plan for acceptance by the Contract Administrator to facilitate installation of riverbank stabilization works (rockfill columns and riprap). The Site Access Plan shall be sufficient to satisfy the Contract Administrator that the proposed access ramps and working platform will be in accordance with this Specification and will not adversely impact riverbank stability for the duration of the project. Acceptance

of the Site Access Plan shall not diminish the Contractor's responsibility for development and maintenance of site access, and adherence to the conditions of the City of Winnipeg Waterway Permit.

(b) The Site Access Plan shall include a plan view layout, typical cross-sections, and sequencing of any access ramps from the top of the bank area onto the riverbank and any working platforms. Cuts and fills shall also be clearly shown in plan and cross-section. Any access to remain in place over the spring flood shall be clearly identified.

(c) As the work proceeds, any changes required to temporary access deviating from the Site Access Plan shall be provided to the Contract Administrator for review and acceptance prior to modifying the access works.

E16.3 Materials

E16.3.1 Fills

(a) The Contractor shall be responsible for supplying imported fill or granular materials, or other materials that the Contractor may deem suitable for its operations, for construction and maintenance of access ramps and working platforms. Any native soil sub-excavated to offset imported fill or granular surfacing materials in order to achieve a balance of cut and fill shall be hauled and disposed off-site immediately.

(b) Rockfill used for granular surfacing of working platforms and ramps may be accepted by the Contract Administrator for backfilling of rockfill columns following compaction, if the materials satisfy the specifications for rockfill column backfill.

(c) Riprap used for widening of working platforms may be accepted by the Contract Administrator for placement as permanent riprap, if the materials satisfy the specifications for riprap.

E16.4 Construction Methods

E16.4.1 Site Access Development

The Contractor shall be responsible to develop and maintain suitable Site access. This includes but is not limited to, temporary bridging over structures, temporary removal and reinstallation of safety fencing, removal of existing trees and shrubs as shown on the Drawings, any landscaping and grading repairs necessary to restore any Site and construction access areas to their pre-existing topography, as accepted by the Contract Administrator. Prior to commencing construction the Contractor shall submit a Site Access Plan to the Contract Administrator for acceptance.

(a) An acceptable Site Access Plan is shown on the Drawings for riverbank stabilization works, which the Contractor may submit as his own. All temporary working platforms shall be constructed as shown on the Drawings. All ramps shall be constructed by balance of cut and fill within the extent of each ramp. Placement of net fill (if required) for temporary access ramps may only occur once lower bank working platform widening downslope of the ramp has been partially constructed using a minimum of 4 times the weight of the required net ramp fill, as accepted by the Contract Administrator. Net ramp fill is defined as any additional fill necessary (beyond a balanced cut and fill within the extent of the ramp) to construct the access ramps.

(b) The Site Access Plan shown on the Drawings assumes the sequence of work shown on the Drawings.

(c) The Contractor may propose modifications to the acceptable Site Access Plan shown on the Drawings in which case the Contract Administrator may require that detailed construction access drawings be submitted for review and acceptance a minimum five (5) business days prior to any construction activity on Site. The Contractor shall retain a geotechnical engineer, at no cost to the City, to prepare the drawings and confirm the proposed modifications will not adversely impact riverbank stability.

(d) The Contractor's Site access routes should be selected to minimize tree removal. Any required tree removal shall be performed in accordance with E14. Any potential

modifications to the rockfill column layout that may result in reduced impacts to existing trees will be reviewed at the onset of construction.

E16.4.2 Waterways Permit for Temporary Access Works

(a) The temporary access ramps and working platforms shown on the Drawings and described herein will be included in the Work covered under the Waterway Permit for the Project, to be obtained and paid for by the City of Winnipeg, Public Works. Any modifications to the limits or grades proposed by the Contractor may require submission of an application for a new or amended permit.

(b) The Contractor is responsible for obtaining and paying for all required permits and permissions that are necessary for Site Development, notwithstanding the original Waterway Permit for the Project paid for by the City of Winnipeg described in E16.4.2(a), including an additional Waterways Permit (if required) from the City of Winnipeg. Contact Kendall Thiessen, Ph. D., P.Eng., Riverbank Management Engineer, at 986-5159 for information regarding Waterways Permits.

E16.4.3 Protection of Existing Infrastructure

The Contractor shall be responsible for protection of existing infrastructure at the Site including above ground and buried infrastructure.

(a) The Contractor is responsible to obtain any required utility clearances prior to commencement of the Works. Any damaged infrastructure shall be repaired at the Contractor's expense.

(b) The Contractor is responsible to protect the existing outfalls from damage due to construction activities. Equipment traffic over the Rue de la Cathedrale and Rue Despins outfall pipes is not permitted unless written approval has been obtained by the Contract Administrator.

E16.4.4 Vegetation and Debris Removal

(a) Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation and existing debris (e.g. deadfall), as well as debris deposited by the river, required to undertake the work, and dispose of the material off Site immediately upon collection. Stockpiling shall not be permitted unless written approval has been obtained from the Contract Administrator.

(b) Remove trees and shrubs as specified on the Drawings, in accordance with CW 3010.

(c) Tree stumps will be ground out to a depth of 150 mm below the normal surface level including all surface roots. Immediately after grinding each stump, the grindings must be removed from the work area. See Drawings for tree removal locations.

(d) Before commencement of any Work, the Contractor shall consult with the Contract Administrator regarding which trees are designated to be removed. The Contractor shall cut down only trees and shrubs designated for removal.

E16.4.5 Snow and Ice Removal

Snow cover shall be cleared from the riverbank and hauled off-site prior to placement of the rockfill riprap or construction of rockfill columns. The methodology to clear the snow may be subject to the acceptance of the Contract Administrator.

Ice at the shoreline of the River shall be broken and cleared before the placement of riprap below ice level. Care shall be taken to ensure that the ice is removed, and does not become trapped below rockfill riprap.

E16.4.6 Safety Fence

The Contractor shall erect and maintain for the duration of the project a safety fence, to restrict access to the Site. The fencing shall enclose the entire Site with appropriate gates or openings that are closed at the end of each Work day. Appropriate signs shall be erected to warn all recreational users of the site and the river that an open water hazard

exists. This shall include but not be limited to pedestrians, cyclists, snowmobilers and skiers. Fence construction on the riverbank shall consist of orange plastic safety fence with a minimum height of 1.2 metres supported by wood posts driven into the ground. The wood posts shall be sized and capable of maintaining the safety fence upright, regardless of conditions. Upon completion of the work, all fence materials shall be removed and disposed off-site.

E16.4.7 Stockpiling

(a) The rate at which materials are delivered to the Site shall be controlled to minimize stockpiling and handling.

(b) The Contractor shall review stockpile locations with the Contract Administrator prior to establishing stockpiles of material.

(c) No stockpiling of materials shall be permitted at the top of the riverbank, along streets or on private properties, unless otherwise accepted by the Contract Administrator.

(d) No more than 100 tonnes of material shall be placed in individual stockpiles on the working platforms where rockfill columns have not been installed and compacted. Larger stockpiles above completed rockfill columns may be approved by the Contract Administrator based on a review of their location relative to overall bank stability.

(e) No stockpiles shall remain on the working platform overnight unless placed on top of backfilled columns.

(f) Stockpiled material shall be handled and maintained in a manner that prevents contamination with other soils and materials, debris, snow or excess moisture. Contaminated material shall be removed and replaced at the Contractor's expense.

(g) Stockpiles shall be maintained to prevent release of fine grain sediments into the river.

E16.4.8 Riverbank Access for Treetop Lookout Construction

The work area for installation of Treetop Lookout foundations and piers will require summer access to the riverbank and may be subject to flooding under high river levels. Temporary raising of the Treetop Lookout work area to a maximum elevation of 227.5 m will be accepted, subject to a review of limits of fill by the Contract Administrator. Temporary fill for this purpose shall consist of clean, crushed rockfill and shall be removed prior to the river levels lowering to Elev. 223.7 m. Refer to Appendix A for a Hydraulic Assessment Report including estimated Red River Flood Level probabilities.

E16.4.9 Measurement and payment for drilling of rockfill columns is based on the working platform elevations shown on the Drawings, and alternate platform elevations shall not affect the measurement of "Drilling of Rockfill Columns".

E16.4.10 Stockpiling of excavated or fill materials shall not be permitted unless approved by the Contract Administrator.

E16.4.11 The Contractor shall remove the access ramp(s) and working platform upon completion of rockfill column and riprap installation by reshaping to the original (pre-construction) riverbank grades shown on the Drawings.

E16.5 Measurement and Payment

E16.5.1 Constructing, maintaining and removal of the access ramps and working platforms shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Site Development", which price shall be payment in full for supplying all materials and performing all operations herein described and all of the items incidental to the work included in this Specification and accepted by the Contract Administrator.

E16.5.2 Site Development will be paid for at a percentage of the Contract Lump Sum Price for "Site Development", specified as follows:

(a) 40% when the Contract Administrator is satisfied that site development has commenced for slope stabilization works;

(b) 40% when the Contract Administrator is satisfied that temporary access ramps and working platforms for slope stabilization are removed;

(c) 20% when Substantial Performance has been met.

E16.5.3 Supply and placement of any imported fill or granular surfacing materials required for construction or maintenance of the temporary access ramps and working platforms shall be considered incidental to "Site Development" and no separate measurement or payment will be made.

E16.5.4 Hauling and disposal of surplus excavated materials shall be considered incidental to "Site Development" and no separate measurement or payment will be made.

E16.5.5 Removal and disposal of existing trees, shrubs and debris shall be considered incidental to "Site Development" and no separate measurement or payment will be made.

E17. ROCKFILL COLUMNS

E17.1 Description

(a) This Specification shall cover all operations relating to excavation, backfilling and densification of the Rockfill Columns.

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

E17.2 Materials

E17.2.1 General

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

E17.2.2 Crushed Rockfill

(a) The material used for the rockfill column fill shall be 150 mm down crushed rockfill manufactured from sound durable dolomite or dolomitic limestone meeting the following properties:

(i) minimum bulk specific gravity of 2.6 (ASTM C127),

(ii) maximum Los Angeles abrasion loss of 35% (ASTM C131),

(iii) maximum soundness loss of 18% (ASTM C88)

(iv) maximum absorption of 2.5% (ASTM C127),

(v) gradation requirements, as follows:

Gradation Requirements 150 mm Crushed Rockfill	
Sieve Opening (mm)	Percent of Total Dry Weight Passing Each Sieve
200	100
150	90 - 100
75	40 – 75
25	10 – 30
5	0 – 12
0.075	0 – 5

(vi) maximum moisture content of 3 percent by weight (ASTM D2216-98).

E17.2.3 Clay Cap

(a) The clay cap at the top of the rockfill columns shall consist of high plasticity clay material with a liquid limit in excess of 50%. The clay shall be free of deleterious material such as roots, organic material, ice, snow or other unsuitable materials, and may be salvaged from the on-site excavation, as approved by the Contract Administrator. Frozen material will not be accepted.

E17.3 Submittals

E17.3.1 At least ten (10) business days prior to the commencement of supply of rockfill for rockfill columns:

(a) The Contractor shall submit the proposed supplier(s) and location of quarry sites for supply of the crushed rockfill and confirm that sufficient quantity of specified rock is available,

(b) The Contractor shall arrange a quarry visit with the Contract Administrator to inspect proposed rockfill stockpiles and observe sampling of three specimens for gradation tests. Gradation test results on two of these specimens shall be supplied to the Contract Administrator within seven (7) business days of the quarry visit at no cost to the City. One specimen shall be delivered to TREK Geotechnical's laboratory at 1712 St. James Street at no cost to the City for confirmatory testing.

(c) Excluding gradation test results noted in E17.3(b), the Contractor shall supply representative test results demonstrating that the rockfill material to be supplied shall be of adequate quality to satisfy the material specification contained herein.

E17.4 Testing and Approval

E17.4.1 All materials set forth in this Specification shall be subject to inspection and testing by the Contract Administrator or by the testing laboratory designated by the Contract Administrator. There shall be no charge for any materials supplied to the Contract Administrator for testing purposes.

E17.4.2 The Contractor shall obtain a sample from rockfill delivered to site for testing at an average frequency of at least once every 4,000 tonnes of rockfill supplied. The samples shall be between 400 to 500 kg and shall be delivered to TREK Geotechnical's laboratory at no cost to the City for further testing. The testing frequency necessary to confirm the material quality will be specified at the discretion of the Contract Administrator. Oversized samples will not be accepted.

E17.4.3 No supply and placement of crushed rockfill will be permitted prior to the Contract Administrator approving the source.

E17.5 Construction Methods

E17.5.1 Excavation

(a) The rockfill column shafts shall be excavated by a drill rig auger to the depth necessary to achieve 1.0 m penetration into dense till. Note that the dense till contact elevation may vary and the depth of excavation may differ from that shown on the Drawings. Note also that the extent of existing riprap may vary from the extent shown on the Drawings, and may be present below the existing grade, particularly on the lower bank working platforms.

(b) Excavated material shall be removed from the riverbank upon excavation and disposed of off-site immediately.

(c) Any deleterious or sloughed material shall be removed from the rockfill column shaft prior to backfilling.

(d) The construction for the rockfill columns shall be a continuous operation with backfilling immediately following excavation.

(e) The Contractor must complete backfilling of each rockfill column before commencing to excavate adjacent rockfill columns.

(f) The Contract Administrator shall survey the as-built working platform elevation at each rockfill column location prior to drilling each rockfill column.

E17.5.2 Deep Sleeving

(a) The Contractor shall install additional sleeving as required to control sloughing and caving of the shafts.

(b) The Contractor shall only be paid for deep sleeving required to advance and maintain an open hole during the excavating, backfilling and compacting procedures, as accepted by the Contract Administrator.

E17.5.3 Supply of Crushed Rockfill

(a) The Contractor shall monitor the supply rate of crushed rockfill to ensure that the backfilling and compacting operations are not delayed.

E17.5.4 Backfilling and Densification

(a) Densification of crushed rockfill shall be achieved using vibratory densification equipment capable of effectively densifying the entire depth of the crushed rockfill in the rockfill column shaft.

(b) Compacting the crushed rockfill with drill augers, free fall of a weight or a backhoe bucket shall not be accepted.

(c) The densification method shall achieve a relative increase in density of 15% after initial placement of the crushed rockfill, as determined by measuring the vertical drop in crushed rockfill after densification.

(d) Following compaction of crushed rockfill and measurement of the vertical drop of the crushed rockfill after densification, the upper portion of each rockfill column shall be backfilled and compacted such that the top of rockfill coincides with the proposed underside of the clay cap at each rockfill location.

E17.5.5 Contaminated Crushed Rockfill

(a) Where crushed rockfill has become contaminated due to the Contractor’s method of operation, negligence, or failure to backfill in a timely manner, the contaminated material shall be rejected and shall be weighed prior to disposal for deduction from the total weight of crushed limestone measured for payment.

E17.5.6 Re-Use of Crushed Rockfill

(a) Crushed rockfill supplied to site for use in temporary access ramps and platforms may be re-used to backfill the rockfill columns following densification, provided it satisfies the requirements for crushed rockfill specified herein.

E17.5.7 Erosion and Sediment Control

(a) Discharge of water contained in the rockfill columns from displacement of the crushed rockfill during backfilling will be acceptable. The Contractor shall be responsible to contain and direct any displaced water such that it will not affect other construction work or cause erosion of the native riverbank soils or introduce sediment laden water directly into the river.

E17.5.8 Stockpiling of Crushed Rockfill

(a) Stockpiling of rockfill material will not be permitted on the riverbank except on top of backfilled rockfill columns as approved by the Contract Administrator.

E17.5.9 Clay Cap

(a) The rockfill columns shall be sealed with a clay cap as shown on the Drawings.

(b) The clay cap material shall be placed within the rockfill column shaft and compacted by mechanical means to eliminate any voids in the clay cap.

E17.6 Measurement and Payment

E17.6.1 Drilling Rockfill Column Shafts

(a) Drilling rockfill column shafts shall be measured and paid for on a vertical length basis. This Work shall be paid for at the Contract Unit Price per vertical metre (v.m) for the "Items of Work" listed here below, completed in accordance with this Specification as measured below the working platform elevation shown on the Drawings and accepted by the Contract Administrator. No additional payment shall be made for variations in working platform elevation from that shown on the Drawings.
Items of Work:
Drill Rockfill Column Shafts

(i) 2.1 m Diameter

(ii) 3.0 m Diameter

E17.6.2 Deep Sleeving Rockfill Column Shafts

(a) Deep sleeving shall be measured and paid for on a unit basis. This Work shall be paid for at the Contract Unit Price per unit for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, 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.

Items of Work
Deep Sleeving Rockfill Column Shafts

(i) 2.1 m Diameter

(ii) 3.0 m Diameter

(b) The Contractor shall not be paid for additional excavation to auger oversized shafts to install the sleeving. Such additional excavation shall be incidental to the cost for sleeving.

(c) The Contractor shall not be paid for installing over-sized sleeves or installing more than one size of sleeve in a shaft.

(d) Vibratory withdrawal of deep sleeving may be used as a means to compact rockfill columns, where the sleeving extends through the entire depth of the column. Where sleeving is used for this purpose, but is not required to control sloughing and caving of the shafts, the cost of sleeving shall be considered incidental to the cost for "Supply, Place and Compact Crushed Rockfill for Rockfill Columns".

E17.6.3 Supply, Place and Compact Crushed Rockfill for Rockfill Columns

(a) Crushed rockfill for the rockfill columns shall be measured and paid for on a weight basis. The weight to be paid for shall be the total weight in tonnes of "Supply, Place and Compact Crushed Rockfill for Rockfill Columns" supplied and placed in accordance with this Specification, measured by truck weight scale tickets as accepted by the Contract Administrator.

(b) No separate measurement shall be made of the compacted clay cap installed. Placing and compacting the clay cap shall be incidental to the work described in this Specification.

E17.6.4 Crushed rockfill used to maintain working surfaces on Site shall not be included in the weight for payment, unless re-used as rockfill column backfill and accepted by the Contract Administrator as "Supply and Compact Crushed Rockfill for Rockfill Columns". For the purposes of measurement for payment, re-used rockfill will be paid based on the volume of rockfill columns backfilled and compacted using re-used rockfill, and the average compacted rockfill density for the project, as estimated by the Contract Administrator.

E18. IMPORTED FILL

E18.1 Description

E18.1.1 This Specification shall cover the placement of imported fill at the north and south ends of the retaining wall and the upper bank pathway to the grades shown on the Drawings.

E18.1.2 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 an incidental to the satisfactory performance and completion of all work hereinafter specified.

E18.1.3 This Specification amends and supplements CW 3110.

E18.2 Materials

E18.2.1 Imported fill material will consist of low to high plastic silty clays or mixtures of sand and clay, uniform in texture.

E18.2.2 The fill material shall be free of wood, vegetation, concrete rubble or stones larger than 25 millimetres in diameter.

E18.2.3 The Contractor may use on-site borrow provided the material satisfies the above requirements, is kept from freezing and can be adequately specified herein. Frozen material will not be accepted.

E18.3 Construction Methods

E18.3.1 Prior to the placement of imported fill, the Contractor shall strip and dispose of topsoil material and bench cut the existing slope as shown on the Drawings.

E18.3.2 Place imported fill in uncompacted lifts not exceeding 200 mm and compact to a minimum 95% of Standard Proctor Maximum Dry Density (SPMDD).

E18.3.3 Imported fill shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Imported fill shall not be placed over frozen soil.

E18.3.4 The Contractor shall notify the Contract Administrator to conduct a cross sectional survey of the stripped surface prior to placement of fill for the purpose of measurement and payment.

E18.4 Measurement and Payment

E18.4.1 Imported fill material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Imported Fill Material”. The volume to be paid for will be the total number of cubic metres of imported fill material supplied and placed in accordance with this Specification, accepted and measured by the Contract Administrator.

E18.4.2 The volume of imported fill material will be computed from cross sections by the method of Average End Areas.

E18.4.3 Stripping topsoil and bench cuts will not be measured and shall be included in the payment made for “Imported Fill Material”.

E19. STRUCTURAL REMOVALS

E19.1 Description

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

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

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

E19.2 Scope of Work

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

(i) Removing and disposing of the handrail;

(ii) Removing and disposing of the sidewalk pavers;

(iii) Removing and disposing of the concrete curb and pavement;

(iv) Removing and disposing of the asphalt pavement;

(v) Removing and disposing of reinforced concrete pile caps;

(vi) Removing and disposing of steel skirting;

(vii) Removing and disposing of concrete and timber pile cut-offs;

(viii) Removing and salvaging of the aluminum traffic barrier rail and posts;

(ix) Excavation and disposal of embankment fill and of all materials required for the structural removals.

(b) All structural removal materials not identified for salvage shall revert to the Contractor for off-site disposal. All unsuitable and surplus excavated material shall revert to the Contractor for off-site disposal.

E19.3 Submittals

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

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

E19.4 Materials

E19.4.1 General

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

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

E19.4.2 Excavations

(a) 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.

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

E19.5 Equipment

E19.5.1 General

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

E19.6 Construction Methods

E19.6.1 General

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

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

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

(d) 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.

(e) Remove timber, steel, concrete and other removal items with appropriate equipment satisfactory to the Contract Administrator. No demolition products are to find their way into the watercourse. The Contractor shall take all necessary precautions to ensure that material do not fall onto any roadways or sidewalks during removal operations.

(f) 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.

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

(h) Provide sawcuts as shown on the Drawings and as herein specified and where otherwise necessary to limit the extent of demolition.

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

(j) Repair any over demolition and reinforcing damage to the satisfaction of the Contract Administrator.

E19.6.2 Details of Existing Structure

(a) The applicable details and structure dimensions of the existing structures are shown on the Drawings for information only in establishing the methods and limits of Work.

(b) The information shown has been obtained from existing Drawings, measurements, and observations of the Site. The accuracy of this information is not guaranteed and the Contractor must verify all information before commencing Work.

E19.6.3 Sequence of Structural Removals

(a) Construction sequencing of all structural removals shall take place as shown on the Drawings.

E19.6.4 Removal of Handrail

(a) Remove and dispose of the handrail.

E19.6.5 Removal of Sidewalk Pavers

(a) The paver system including bedding sand shall be completely removed to existing ground level by means as approved by the Contract Administrator. Remove material from the Site.

E19.6.6 Removal of Timber and Concrete Pile Cut-Offs

(a) Remove and dispose of timber and concrete piles to the depths and limits of removals, as specified on the Drawings.

(b) Remove and dispose of all timber, concrete and steel strand.

(c) This shall also include the cutting of the pile.

E19.6.7 Removal of Concrete Curb and Pavement

(a) Sawcut and remove and dispose of concrete curb and pavement to the depths and limits of removals, as specified on the Drawings.

(b) This shall include the removal of asphaltic concrete.

E19.6.8 Removal of Reinforced Concrete Pile Cap

(a) Remove and dispose of reinforced concrete pile cap to the depths and limits of removals, as specified on the Drawings.

(b) Removals shall be undertaken using hydraulic hammering, or by other means, as approved by the Contract Administrator.

(c) Remove and dispose of all concrete, reinforcing steel and void form.

E19.6.9 Removal of Steel Skirting

(a) Remove and dispose of steel skirting by pulling the entire length from the ground, or by other means or limits, as approved by the Contract Administrator.

(b) Remove and dispose of all steel skirting.

E19.6.10 Remove and Salvage Aluminum Barrier Rail and Posts

(a) All aluminum traffic barrier components, including hardware, shall be carefully removed and salvaged. The Contractor shall only use methods of removal that will not damage the salvage items.

(b) The salvage items shall be delivered to the City of Winnipeg Bridge Yard at 960 Thomas Avenue and unloaded and stockpiled there by the Contractor in a location identified by the City.

E19.6.11 Waste Handling and Disposal of Removed Materials

(a) Wherever practical, the Contractor shall recycle disposed materials.

(b) The Contractor shall submit a list of locations of disposal/recycling for all removed materials to the Contract Administrator.

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

E19.6.12 Excavation

(a) Prior to commencing any excavation Works, underground clearances shall be obtained from all applicable utilities by the Contractor. Due care and caution shall be taken by the Contractor to work around all identified underground utilities.

(b) The excavations shall be made in a manner such that all sidewalk structure components may be properly removed to the required depths and as shown on the Drawings.

(c) Excavations shall be completed to the limits shown on the Drawings 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.

(d) All material shall be brought to the surface by approved method, and shall be deposited on the river bank slope if deemed suitable material or disposed of away from the Site if deemed unsuitable material.

E19.7 Quality Control

E19.7.1 Inspection

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E19.7.2 Access

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

E19.8 Measurement and Payment

E19.8.1 Structural Removals

(b) Structural removals will not be measured and will be paid for at the Contract Lump Sum Price for “Structural Removals”, which price shall be payment in full in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E19.8.2 Excavation

(a) Excavation shall be considered incidental to Structural Removals requiring excavation, and no separate measurement or payment shall be made for this Work.

E20. EROSION CONTROL BLANKET

E20.1 Description

E20.1.1 This Specification shall cover supply and installation of erosion control blankets on exposed soils on the working platforms and access ramps, and other areas disturbed during construction.

E20.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E20.2 Materials

E20.2.1 Erosion Control Blanket (ECB)

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

(b) The blanket shall be of consistent thickness with the coconut fibres evenly distributed over the entire area at a minimum of 0.27 ± kg of coconut fibre/m².

(c) Biodegradable reinforcement netting on both sides manufactured from heavy weight cotton or jute fibre thread. (1.47 kg/100m of thread). The mesh dimension shall be a 16 x 16 mm sewn together on 38 mm centres.

(d) Approved products are:

(i) Erosion Control Blanket C32BD;

(ii) North American Green C125BN

(e) The Contractor shall submit all manufacturers' product specifications and recommended installation methods for the proposed erosion control blankets.

E20.3 Construction Methods

E20.3.1 Erosion Control Blanket (ECB) shall be installed over exposed unvegetated areas of the riverbank following completion of temporary access removal on the riverbank. The ECB shall be installed prior to rising river levels in the spring, following riverbank stabilization.

E20.3.2 ECB Installation

(a) The Contractor shall follow the manufacturer's recommended installation procedure, as well as the following requirements.

(b) Roll blanket out in direction of water flow (parallel to shoreline).

(c) Securely fasten blanket against soil surface with a staggered staple pattern as per the manufacturer's recommendations and as accepted by the Contract Administrator.

(d) At blanket edges overlap upstream blanket over downstream blanket by a minimum of 150 mm and secure overlaps.

(e) The upstream edge of the blanket shall be secured in a 150 mm deep by 150 mm wide trench and anchored with staples at a maximum of 300 cm spacing. The trench shall be backfilled with compacted clay.

E20.3.3 ECB Maintenance

(a) The areas covered with ECB shall be regularly inspected, and in particular after severe rainfall, or flooding events to check for blanket separation or breakage until the end of the warranty period or until vegetation growth has been established.

(b) Any damage or poorly performing areas shall be replaced/repaired immediately. Regrading of the slope by manual labour methods may be required in the event of rill or gully erosion.

E20.4 Measurement and Payment

E20.4.1 Erosion Control Blanket

(a) Erosion Control Blanket shall be measured on an area basis and paid for at the Contract Unit Price per square meter for "Supply and Install Erosion Control Blanket", which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, as accepted and measured by the Contract Administrator.

(b) Areas requiring replacement as directed by the Contract Administrator will be re-measured and additionally paid for at the Contract Unit Price for the Work item. The Contractor shall be compensated for replacing ECB only if the damage occurred as a result of conditions beyond their control, such as severe run-off, or from ice or floating debris. The Contractor shall not be compensated for replacing or repairing ECB

damaged as a result of faulty materials, installation methods, or the Contractor's own operations.

E21. EROSION AND SEDIMENT CONTROL

E21.1 This Specification covers the supply, implementation and maintenance of erosion control measures during construction and not specifically covered in E20 to control the release of sediments into the river during and following construction.

E21.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E21.3 Materials

E21.3.1 The Contractor shall maintain a supply of erosion control products such as erosion control blankets, silt fencing, straw bales or mulch on Site at all times suitable for trapping and preventing sediments from entering the river during construction.

E21.4 Construction Methods

E21.4.1 Construction

(a) The Contractor shall plan and carry out all his Work in a manner that will mitigate the potential for the release of sediments into the river.

(b) Sediment control measure shall be implemented to meet the requirements of Fisheries and Oceans Canada.

(c) The Contractor shall monitor his Work and implement appropriate sediment control measures as Site conditions warrant. Such measures may include installation of silt fences, straw bales or other measure as required in the event that there is runoff from the Site

(d) Upon completion of the construction Work, all surplus or waste materials, and materials containing fine-grained sediments shall be removed from the Site.

E21.5 Measurement and Payment

E21.5.1 No separate measurement or payment shall be made for erosion control measures supplied, installed and maintained under this Specification. This Work shall be incidental to "Site Development".

E22. RIPRAP

E22.1 Description

E22.1.1 These Specifications govern all operations necessary for and pertaining to the supplying and placing of approved riprap as a protective covering along the side slopes and base of the river channel, pier ice scour berm or such other places as may be indicated on the Drawings or designated by the Contract Administrator in the field.

E22.1.2 This Specification shall amend and supplement Specification No. CW 3615.

E22.2 Submittals

E22.2.1 The Contractor shall submit the proposed supplier(s) and location of quarry sites at least ten (10) business days prior to the supply of riprap to the Site, to confirm that sufficient quantity of specified rock is available.

E22.2.2 The Contractor shall supply representative test results at least ten (10) business days prior to the supply of riprap to the Site, demonstrating that the material to be supplied is of adequate quality and gradation to satisfy the material specifications contained herein.

E22.3 Materials

(a) The material used for the riprap shall be 450 mm down quarried rock manufactured from sound durable dolomite or dolomitic limestone or dolomite meeting the following properties:

(i) minimum bulk specific gravity of 2.6 (ASTM C127),

(ii) maximum Los Angeles abrasion loss of 32% (ASTM C131),

(iii) maximum soundness loss of 13% (ASTM C88)

(iv) maximum absorption of 2.5% (ASTM C127),

(v) gradation requirements, as follows:

(b) The riprap shall be well graded having a full range and even distribution of sizes and shall conform to the following gradation:

GRADATION REQUIREMENTS FOR RIPRAP

Diameter (mm)	Percent Passing by dry weight
450	100%
300	40-70%
100	25-50%
5	0-5%

(a) Individual particles shall be shaped such that no dimension is greater than four times the smallest dimension. Flat, elongated, or platy particle shapes will not be accepted.

(b) The diameter shall be taken as the average of the shortest and longest dimension measured on an individual piece of riprap.

(c) Riprap shall be free from sod, roots, organic material and debris prior to placement. Individual pieces of riprap shall be free of defects such as seams or cracks that would cause rapid or excessive deterioration or degradation.

(d) Contractors supplying riprap shall be responsible for demonstrating that the material is of adequate quality, gradation, and volume to meet the material specifications contained herein.

(e) All materials set forth in this Specification shall be subject to inspection and testing by the Contract Administrator or by the testing laboratory designated by the Contract Administrator.

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

(g) No supply and placement of riprap will be permitted prior to the Contract Administrator approving the source.

(h) The testing frequency necessary to confirm the material quality will be specified at the discretion of the Contract Administrator.

E22.4 Construction Methods

E22.4.1 The riprap shall be dumped or placed in such a manner that the larger particles are uniformly distributed, the smaller particles serve to fill the spaces between the larger particles, and that excessive segregation of the various particle sizes does not occur. Sufficient placing and leveling shall be done to produce a firmly bedded neat and uniform surface conforming to the thickness, shape, and dimensions shown on the plans.

E22.4.2 The riprap shall be placed to the grades and lines shown on the Drawings.

E22.4.3 The Contractor is advised that it may be necessary to break ice to place the riprap to the dimensions shown on the drawings. The Contractor is required to supply and install the appropriate safety fences and signage for open water and thin ice conditions.

E22.4.4 The winter river level shown on the drawings is based on typical conditions. The Contractor is advised that river levels at the time of construction may vary from the level indicated.

E22.4.5 Riprap supplied to site for use as temporary rockfill for temporary platform widening may be re-used as riprap, provided it satisfies the requirements for riprap specified herein. Otherwise, temporary riprap shall be removed, hauled, weighed and disposed off-site at no cost to the City.

E22.5 Measurement and Payment

E22.5.1 Supply and placement of riprap shall be measured on a weight basis and paid for at the Contract Unit Price per tonne for “Supply and Place Riprap” for the total number of tonnes measured by truck weight scale tickets as accepted by the Contract Administrator.

E22.5.2 The Contractor is to supply all truck weight scale tickets to the Contract Administrator by the end of each work day.

E22.5.3 Sub-excavation and disposal of excavated soil, shaping the riprap bed, supplying, loading, hauling, and placing stone riprap shall be considered incidental to the Work.

E22.5.4 Riprap used to construct widened temporary work platforms and the temporary river access road shall not be included in the weight for payment, unless re-used as riprap accepted by the Contract Administrator as “Supply and Place Riprap”. For the purposes of measurement for payment, re-used riprap will be paid based on the total tonnes of riprap supplied, minus the weight of temporary riprap disposed, as accepted by the Contract Administrator. The weight of temporary riprap disposed shall be measured by truck weight scale tickets as accepted by the Contract Administrator.

E23. CELLULAR CONCRETE BACKFILL

E23.1 Description

E23.1.1 This Specification shall cover the supply and installation of cellular concrete backfill, as specified herein and as shown on the Drawings.

E23.1.2 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 other things necessary or incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E23.2 References

(a) CAN/CSA A3001, Cementitious Materials for Use in Concrete

(b) CSA A23.1, Concrete Materials and Methods of Concrete Construction

(c) ASTM C869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

(d) ASTM C796, Standard Test Method for Foaming Agents for Use in Producting Cellular Concrete Using Preformed Foam

(e) ASTM C495-99a, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

E23.3 Qualification

E23.3.1 The Contractor is to submit the qualifications of the Subcontractor that is to produce and place the cellular concrete for review and approval by the Contract Administrator.

E23.3.2 The approved Subcontractor producing and placing cellular concrete shall have a record of experience and quality of work that is satisfactory to the Contract Administrator, and shall be capable of developing a mix design, batching, mixing, handling, and placing cellular concrete. The Subcontractor shall be certified by the manufacturer of the foaming agent and regularly engaged in the production and placement of cellular concrete. The Subcontractor shall have an adequate number of fully qualified workers who are thoroughly trained and experienced in the production and placement of cellular concrete.

E23.4 Equipment

E23.4.1 The specialized batching, mixing, and placing equipment shall be automated and certified for the purpose by the manufacturer of the cellular concrete material. Dry-mix equipment must be able to receive bulk cement and produce over 100 cubic metres per hour on site, continuously, from one piece of equipment, and pump through hoses or pipes up to a flat lineal distance of 1000 metres. Bulk cement shall be weighed on a scale that operates within a tolerance of one and one-half percent (1.5%) per batch. Wet-mix equipment must be able to receive slurry on site into the equipment and process it continuously during ready-mix supply, and pump through hoses or pipes up to a flat lineal distance of 200 metres.

E23.4.2 Cellular concrete must be pumped by a positive displacement pump (Peristaltic or similar). A foam generator shall be used to continuously produce pre-formed foam, which shall be injected and mixed with the cementitious slurry downstream of the positive displacement slurry pump. The equipment shall be calibrated to produce a precise and predictable volumetric rate of foam with stable uniform microbubbles.

E23.5 Materials and Testing

E23.5.1 Cellular concrete shall be CEMATRIX CMEF-400 lightweight engineered fill, or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes”, with the following properties:

(a) Minimum unconfined compressive strength at 28 days of 0.3 MPa.

(b) Wet cast density of 400 kg/m^3 (+/-10%)

E23.5.2 Portland cement shall conform to the requirements of CSA Standard CAN/CSA A3001, Type GU or HE. Supplementary cementing materials shall conform to the requirements of CSA Standard CAN/CSA A3001.

E23.5.3 Mixing water shall conform to the requirements of CSA Standard A23.1. Water of questionable quality shall not be used unless proven to produce specimens whose 28-day compressive strength is at least 90% of those made with known acceptable water and an identical material mix.

E23.5.4 Foaming agents shall conform to the requirements of ASTM C869 when tested in accordance with the provisions of ASTM C796. CEMATRIX CF-1 or PROVOTON foaming agents shall be used, or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes”. The Subcontractor shall be pre-qualified and approved in writing by the foaming agent manufacturer, referencing this Project. A copy of the written approval is to be submitted to the Contract Administrator prior to the commencement of the work.

E23.5.5 The fresh cellular concrete density shall be measured and recorded once per production run, or once for every 50 cubic metres, or once per 30 minutes, whichever is more frequent. The density shall be maintained within +/- 10% of the design density.

E23.5.6 Cellular concrete samples must be captured, cured, and tested to verify the compressive strength requirement is satisfied. One sample is comprised of one set of six cellular concrete cylinders. One sample should be taken for each placement, or every 100 m^3, whichever is more frequent. Cylinders are cast in 75mm by 150mm cylindrical plastic molds. The sample mold must be lined with “freezer paper” with the plastic side against the cellular concrete. Cellular concrete cylinders shall be cured and tested as per ASTM C495-99a, modified to represent the field curing conditions for geotechnical applications.

E23.6 Subgrade Conditions and Site Preparation

E23.6.1 The subgrade shall be cleared of vegetation, soft, wet, muddy, loose soil and other deleterious material, and graded and compacted to the lines and grades shown on the relevant drawings. The prepared subgrade shall be good competent level ground with nominal compaction to provide a firm base. The placement area shall be free of standing water during placement of cellular concrete and until backfill is placed on top of the cellular concrete. Snow and ice must be removed from the area prior to placement.

E23.7 Installation

E23.7.1 The Quality Control and Quality Assurance Manual Cematrix Cellular Concrete, Document Number: QCS-007, Last Updated: September 29, 2011 shall apply to the work.

E23.7.2 Any items to be fully or partially encased in the cellular concrete shall be properly set and stable prior to the installation of the cellular concrete.

E23.7.3 Where required, formwork should be designed and installed to withhold cellular concrete, and may require lining with poly sheeting or similar impermeable membrane to prevent leakage. The sheet drain system on the side of the steel sheet piles shall also be lined with poly sheeting.

E23.7.4 Cellular concrete may be placed during freezing conditions, provided measures are taken to prevent damage to the cellular concrete until sufficient strength has been attained. Care should be taken to avoid freezing before initial set. Cellular concrete must not be placed during heavy or prolonged precipitation.

E23.7.5 Once mixed, the cellular concrete shall be conveyed promptly to the location of placement without excessive handling.

E23.7.6 The Contractor shall determine the maximum lift thickness based on density and any other considerations that may impact placement. Cellular concrete shall be cast in a formed area within 1 to 2 hours, to permit an undisturbed setting.

E23.7.7 Finished surface elevation shall be with +/- 25mm of the design grades shown on the Drawings. Cellular Concrete can be placed with a maximum slope of 1%. Slopes greater than 1% will require profiling by creating steps for the Cellular Concrete with formwork.

E23.7.8 Loading of, or traffic on, the cellular concrete shall be prevented until the material has attained sufficient strength to withstand the loads with no damage. Backfill can commence with cellular concrete supports foot traffic without leaving an indentation.

E23.8 Measurement and Payment

E23.8.1 Cellular concrete shall be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Cellular Concrete” 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, accepted and measured by the Contract Administrator.

E24. STEEL SHEET PILE WALLS

E24.1 Description

E24.1.1 This Specification covers all operations related to the construction of steel sheet pile retaining walls.

E24.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E24.2 Submittals

E24.2.1 Certificates

(a) At least two (2) weeks prior to start of pile driving, submit to the Contract Administrator, two (2) copies of steel producer mill test data and certification that steel piling, delivered to job site, meets requirements of this Section and is in accordance with CAN/CSA-G40.20-13.

E24.3 Materials

E24.3.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

E24.3.2 Steel Sheet Piles: To CAN/CSA-G40.21-13 (including chemical and mechanical requirements), Grade 350W, and following:

(a) Continuous interlocking, flat web with minimum web thickness 13.3mm and minimum mass of 155.4 kg/m^2.

(b) Continuous interlocking (Z) section:

(i) Minimum effective section modulus of 2600 cm^3 per metre of wall.

(ii) Minimum flange thickness of 15.2mm.

(iii) Minimum web thickness of 13.3mm.

(c) Sheet Piling: As manufactured by Gerdau, section designation PZC26 or in accordance with B8 by Contract Administrator.

(d) Special Corners: Shop fabricate by welding or provide standard fabricated special corner connectors for type of steel piling supplied.

(e) Interlocks: Section of interlock bar of 1m minimum length which will pass along full length of pile without binding.

(f) Mark each piece of sheet piling legibly by stencilling or die-and-stamping with the following information:

(i) Heat Number

(ii) Manufacturer’s Name

(iii) Length and Section Number

(g) Do not precut lifting or slinging holes in sheet piles.

E24.4 Construction Methods

E24.4.1 Delivery, Handling and Storage

(a) Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.

(b) Store sheet piling on level ground or provide supports so that sheet piling is level when stored. Provide blocking at spacing not exceeding 5m so that there is no excessive sagging in piling. Overhang at ends not to exceed 0.5m. Block between lifts directly above blocking in lower lift.

(c) If material is stockpiled on structure, ensure that the structure is not overloaded.

E24.4.2 Installation

(a) Welding to be in accordance with CSA W59-03 except where specified otherwise.

(b) Pile installation is not to commence until all required quality control tests have been completed and test results approved by the Contract Administrator.

(c) For installation of sheet piles, provide installation equipment capable of installing sheet pile to elevations indicated.

(d) Submit full details of method and sequence of installation of piling to Contract Administrator for approval prior to start of pile installation work. Details must include guide frames and bracing if required, setting and driving sequence and number of piles in panels for driving.

(e) Do not drive sheet piles within a radius of 8 metres of concrete which has been in place for a time shorter than 3 days unless authorized by the Contract Administrator.

(f) Remove loose and displaced material from around sheet piles after completion of driving, and leave clean, solid surfaces to receive backfill.

(g) Provide sufficient length above cut-off elevation so that part damaged during driving is cut off. Cut off sheet piles neatly and squarely at elevations indicated.

(h) When installation is complete, face of wall at top of sheet piles to be within 25mm of location as indicated and deviation from batter not to exceed 1 in 100.

(i) If, in the opinion of the Contract Administrator, piles are placed beyond tolerances specified, the Contractor may be required to remove such piles and install new piles to the specified tolerances at his own expense.

(j) Cut weep holes as indicated. Provide filter material in area of weep holes as indicated.

(k) Remove cut-off lengths from site on completion of work.

(l) Drill 50mm dia. hole through sheet pile to match locations for installation of steel reinforcing bars.

E24.4.3 Obstructions

(a) If an obstruction is encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.

(b) Advise the Contract Administrator immediately if impossible to drive pile to full penetration, and obtain direction from Contract Administrator on further steps required to complete work.

E24.4.4 Cutting

(a) When flame cutting tops of piles and flame cutting weep holes in piles, adopt the following procedure:

(b) When air temperature is above 0^{o}C, no pre-heat is necessary.

(c) When air temperature is below 0^{o}C, pre-heat until steel 25mm on each side of line of cut has reached a temperature very warm to hand (approximately 35^{o}C). Tempil stocks or temperature indicating crayon marks may be used to measure temperature.

(d) Use torch guiding device to ensure smooth round holes or straight edges.

(e) Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5mm.

E24.4.5 Splicing

(a) Use full length piles unless splicing is indicated or unless approved by Contract Administrator.

E24.5 Quality Control

E24.5.1 Source Quality Control: Hot Rolled Steel Sheet Piling

(a) Provide results of tests of sheet piling material to be used on project as follows:

(i) One tension test (and 1 bend test) from each heat for quantities of finished material less than 50 tonnes.

(ii) Two tension tests (and 2 bend tests) from each heat for quantities of finished material exceeding 50 tonnes.

(b) Tension tests in accordance with CAN/CSA-G40.20-13; (bend tests in accordance with ASTM-A6/A6M-13).

E24.5.2 Quality Assurance

(a) Inspection and testing of steel sheet piling material to be carried out by testing laboratory designated by the Contract Administrator at any time during the course of the Work.

(b) Materials inspected or tested by the Contract Administrator which fail to meet Contract requirements will be rejected at any time in course of work.

(c) Where tests or inspections by designated testing laboratory reveal work not in accordance with Contract requirements, Contractor to pay costs for additional tests or inspections as Contract Administrator may require to verify acceptability of corrected work.

E24.6 Measurement and Payment

E24.6.1 Supplying and Driving Steel Sheet Piles

(a) Supply and driving of steel sheet piles will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for “Supply and Driving Steel Sheet Piles”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

(b) Splicing of piles shall be incidental to the Works.

E25. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

E25.1 Description

E25.1.1 General

(a) This Specification covers all operations relating to the supply and installation of cast-in-place concrete piles for the piers including but not limited to overburden drilling, water control, inspection, supply and installation of steel sleeves, galvanizing of steel sleeves, supply and placement of concrete and reinforcing steel, supply, installation, and removal of temporary steel casings, supply and installation of threaded rod anchors, nuts, and washers, and disposal of excavated material.

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

E25.1.2 Elevations on Drawings

(a) The pile elevations shown on the Drawings are approximate only. Refer to the test hole logs and all other available information to grain more knowledge about the surface and subsurface conditions.

E25.2 Submittals

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any tremie concrete operations the proposed tremie concrete procedures.

E25.3 Materials

E25.3.1 General

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

E25.3.2 Handling and Storage

(a) Storage of materials shall be in accordance with CSA Standard CAN/CSA A23.1. Materials damaged by careless or negligent handling or storage by the Contractor shall be replaced at the Contractors expense.

E25.3.3 Testing

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

(b) All materials shall be approved by the Contract Administrator at least 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 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 their own expense.

E25.3.4 Steel Pier Sleeves

(a) Steel pier sleeves shall be as follows:

(i) 762 mm outside diameter x 12 mm thick permanent sleeve as indicated on the Drawings, conforming to the requirements of ASTM A252 Grade 3, with a minimum yield strength of 310 Mpa. Pier sleeves shall be hot dip galvanized for the full length;

(ii) when mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate; and,

(iii) splicing of steel pier sleeves is not permitted.

(b) Galvanizing shall be in accordance with ASTM A123/A123M to a minimum net retention of 610° g/m^2.

E25.3.5 Concrete

(a) The concrete shall conform to Specification E30.

(b) The concrete shall be placed by the tremie method.

E25.3.6 Reinforcing Steel

(a) The reinforcing steel shall conform to Specification E31.

E25.3.7 Threaded Rod Anchors, Bolts, Nuts, Lock-Washers and Flat Washers

(a) Threaded rod anchors, bolts, nut and washers shall be in accordance with ASTM F1554 (Grade 105) and shall be hot-dip galvanized full length in accordance with ASTM F2329 for a minimum net retention of 610 g/m^2, for the entire length of the anchors. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E25.3.8 Anchor Bolt Templates

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

E25.3.9 Miscellaneous Materials

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

E25.4 Equipment

E25.4.1 All equipment shall be of a type accepted by the Contract Administrator and shall be kept in good working order.

E25.4.2 Tremie Equipment

(a) The tremie pipe shall consist of a tube, having a diameter of not less than 250 mm, constructed with sections having flange couplings fitted with gaskets. The discharge end shall have a proper seal so that water will not enter the tube at any time.

E25.5 Construction Methods

E25.5.1 Location and Alignment of Piles

(a) Pile construction shall not commence until the Contractor has obtained clearance from the appropriate Utility Authorities including but not limited to Manitoba Hydro, MTS and City of Winnipeg Water and Waste.

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

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

E25.5.2 Buried Utilities

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

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

E25.5.3 Excavation

(a) Pile excavation shall be achieved by auguring (i.e. drilling) for the full depth of all piles.

(b) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough “slack” in conduits to move them slightly to avoid interference with the pile locations.

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

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

(e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement shall be set in place and the concrete placed for pour 1 immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.

E25.5.4 Temporary Steel Casings

(a) Steel or corrugated metal pipe casings shall be used if required to temporarily line the excavation to prevent bulging or caving of the walls.

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

(c) The casing shall be withdrawn as the concrete is placed in the excavation. The casing shall extend at least 1 m below the top of the freshly deposited concrete at all times.

(d) The clearance between the face of the excavation and the casing shall not exceed 75 mm.

E25.5.5 Inspection of Excavations

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

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

(c) Any improperly set casing or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E25.5.6 Placing Reinforcing Steel

(a) Reinforcement shall be:

(i) placed in accordance with the details shown on the Drawings;

(ii) rigidly fastened together; and

(iii) lowered into the excavation intact before concrete is placed.

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

E25.5.7 Placing Anchor Bolts

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

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

E25.5.8 Placing Concrete

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

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

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

(d) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator. Tremie concrete shall be placed as specified herein.

(e) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations so that the concrete is thoroughly worked around the reinforcement and around embedded items; eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness.

E25.5.9 Tremie Concrete

(a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

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

E25.5.10 Protection of Newly Placed Concrete

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

E25.5.11 Curing Concrete

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

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

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

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

E25.5.12 Cold Weather Concreting

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

E25.6 Quality Control

E25.6.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.

E25.6.2 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

E25.7 Measurement and Payment

E25.7.1 Construction of Cast-in-Place Concrete Pile Foundations

(a) Construction of cast-in-place concrete pile foundations shall be measured on a per metre length and paid for at the Contract Unit Price per metre for “Construction of Cast-in-Place Concrete Pile Foundations”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.

E26. SUPPLY, FABRICATION AND DELIVERY OF STRUCTURAL STEEL FOR TREETOP LOOKOUT

E26.1 Description

E26.1.1 General

(a) This Specification covers all operations relating to the supply, fabrication, shop assembly, loading, blocking, delivery of structural steel as shown or described on the Drawings in this Specification including the following:

(i) girders;
(ii) stiffener plates;
(iii) diaphragms;
(iv) pier beams;
(v) base plates;
(vi) shear connector studs;
(vii) connection plates;
(viii) lifting devices;
(ix) all shop and field high strength connection bolts;
(x) shop and field welds;
(xi) all other members required to complete the steel superstructure as shown on the Drawings and specified herein; and
(xii) all labour, material and equipment required to load and block the steel superstructure.

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

(c) The Contractor shall notify the Contract Administrator of any subcontractors (Fabricators) that have been subcontracted by the Contractor to fabricate, load and transport the structural steel components. The Contractor shall remain responsible for the work of such subcontractors. All requirements, such as right to access, shall apply to such subcontractors.

(d) Quality Control of materials and fabrication.

(e) Hot-dip galvanizing of all steel components, after fabrication.

E26.2 References

E26.2.1 The Fabricator shall insure that the steel fabricator's foreman and welding supervisor have a copy of the Specifications; and are readily available for the Contract Administrator's reference.

(a) CSA G40.20/G40.21-13 – Structural Quality Steels

(b) ASTM A709/A709M-16a – Structural Steel for Bridges

(c) ASTM A588/A588M-15 – High-Strength, Low-Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance

(d) ASTM A572/A572M-15 – High-Strength, Low-Alloy Columbium-Vanadium Structural Steel

(e) ASTM A36/A36M-14 – Carbon Structural Steel

(f) ASTM A500/A500M-13 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

(g) ASTM F3125M-15a, Grade A325, Type 1 – High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength

(h) ASTM F1554-15e1 – Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength

(i) CSA W59-13 – Welded Steel Construction (Metal Arc Welding)

(j) AWS D1.5/D1.5M:2015 – Bridge Welding Code

(k) AWS A5.29/A5.29M:2010 – Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding

(l) CSA W47.1-09 (R2014)– Certification of Companies for Fusion Welding of Steel Structures (25a) AISC Category III Major Steel Bridges

(m) CSA W178.2 – 2014 – Certification of Welding Inspectors

(n) ASTM A123/A123M-15 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(o) ASTM A143/A143M – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

(p) ASTM A153/A153M-16 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware

E26.3 Submittals

E26.3.1 The Contractor shall submit the following documents to the Contract Administrator.

(a) Copies of Mill Test Certificates in accordance with CSA G40.20/G40.21-13 (ASTM A6), showing chemical analysis and physical tests of all structural steel prior to commencement of fabrication. Structural steel without certification will be rejected.

(b) A complete set of Shop Drawings prior to commencement of fabrication:

(i) the Contractor shall indicate on the Shop Drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the Drawings and Specifications;

(ii) applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings. The welding procedures used shall be indicated on Fabricator's Shop Drawings by cross-referencing them with the standard sheets submitted; and,

(iii) in no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings.

(c) Clearly identify all Shop Drawings and correspondence submitted to the Contract Administrator with the project title as it appears on the Contract Drawing‟s title block including subdivision and mileage.

(d) Clearly indicate shop and erection details including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.

(e) Final revised and As-built Shop Drawings shall be submitted in electronic form. Electronic form shall be submitted in a CD disk in two different formats – ADOBE ACROBAT “PDF” and AutoCAD “DWG”.

(f) Shop Drawings shall be drawn to the same system (Metric or Imperial) as the Contract Drawings.

(g) Submit Manufacturer‟s test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

(h) Welding Procedure Specification (WPS), including weld sizes, position of welding, preaheating, types of electrodes, flux, current, and sequence of welding in addition to stress-relief heat treatment shall be submitted for the Contract Administrator‟s review. Any standard sheets submitted for review shall be marked up to indicate clearly the type of weld to be used for every particular application.

(i) The Contractor shall submit a proposed erection procedure to the Contract Administrator for review at least 14 days prior to transporting girders for erection. This

submission shall be signed and sealed by a Professional Engineer registered in the Province of Manitoba.

(j) Three (3) weeks prior to shipping, provide four (4) copies of loading, blocking, and shipment scheme, including the proposed route and all traffic control procedures stamped by Professional Engineer registered to practice in the Province of Manitoba.

(k) All joints and procedures shall be approved by the Canadian Welding Bureau in accordance to CSA W59 or AWS D1.5.

(l) The Contractor shall submit a Detailed Quality Control Report including test results as specified in this Specification certified by welding inspector certified by the CWB to the requirements of CAN/CSA 178.2 (Level III) for bridges and structures.

(m) Submit three (3) weeks prior to steel girder hot-dip galvanizing a hot-dip galvanizing plan for the steel girder galvanizing in accordance with ASTM A143/ A143M

E26.4 Materials

E26.4.1 General

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

(b) The Contractor shall mark all materials to identify its material specification and grade. This shall be done by suitable marking or by a recognized colour coding.

(c) The types and grades of structural steel used shall be as shown on the Drawings or as specified in this Specification.

(d) Materials called for under these Specifications and on the Drawings shall, unless otherwise specified, satisfy the testing procedures and be in strict accordance with the requirements set out in the latest edition of the standards identified.

E26.4.2 Structural Steel

(a) Structural steel for the girders, pier beams and diaphragms shall conform to the requirements of CSA Standard CSA G40.20-04/G40.21-04 (2009), Grade 350W.

(b) Structural steel for the plates shall conform to the requirements of CSA Standard CSA G40.20-04/G40.21-04 (2009), Grade 300W.

(c) Furnish to the Contract Administrator’s Shop Inspector mill test reports, properly correlated to all steel sections to be used for steel construction under this Specification.

(d) All identification and erection marks shall be located on surfaces which will not be visible in the completed structure.

(e) Fabrication shall be carried out in the Fabricator's own plant, the use of subcontractors for all or portions of the fabrication will only be considered unless applied for in writing by the Fabricator and subsequently approved in writing by the Contract Administrator. The Fabricator shall be fully responsible for the quality of work and shall bear all additional costs related to work being carried out at the subcontractors plant such as additional quality inspections, shipment, etc.

(f) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate. The mill test certificate shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.

E26.4.3 High Strength Bolts, Nuts and Washers

(a) Bolts to ASTM F3125M, Grade A325, Type 1, nuts to ASTM A563-C3 Grade DH3 and washers to ASTM F436 Type 1, hot-dip galvanized. Bolt tightening shall be provided by means of the turn-of-nut method.

(b) Proof shall be submitted to the Contract Administrator demonstrating that the bolts, nuts and washers meet the chemical composition, mechanical properties, dimensions, workmanship and head burst as required by ASTM A325/ A325M, A563/ A563M and F436/ F436M. Verification of the acceptability of assemblage of zinc coated bolts shall be provided with the bolts, nuts and washers delivered to the job site shall also be submitted to the Contract Administrator.

(c) For bolts supplied from a manufacturer outside of Canada or United States of America, the above information shall be independently verified by testing by a Canadian laboratory as outlined in the Clause E64.4.2(j).

E26.4.4 Welding

(a) Welding electrodes and fluxes shall conform to the latest revised editions of:

(i) CSA W48 / AWS D1.5/D1.5M for submerged arc welding;

(ii) CSA W48 / AWS D1.5D1.5M for manual welding; and,

(iii) AWS A5.29 / A5.29M for flux cored arc welding.

(b) The deposited weld metal shall have atmospheric corrosion properties and Charpy V-Notch impact resistance properties similar to the parent metal being welded.

(c) The electrodes for manual welding shall be low-hydrogen Type E55018-C3 (E8018-C3).

(d) The electrode for flux core welding shall be Low Hydrogen E8XTX-Ni1 (E7XT8-Ni1).

(e) All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.

E26.4.5 Hot Dip Galvanizing

(a) Hot Dip galvanizing of steel elements identified on the Drawings as being hot-dip galvanized shall be executed after fabrication of the element and shall be in accordance with ASTM A123 and CSA G164 and shall have a minimum mass of zinc coating of 610 g/m_2 (2 oz//ft^2).

(b) Galvanized nuts shall be tapped oversize according to ASTM A563 and shall meet the requirements of supplementary Requirement S1 of ASTM 563. Excess hot-dip galvanizing on threaded portions shall be removed by centrifuging or air blasting immediately upon withdrawal; flame chasing is prohibited.

E26.4.6 Shear Connector Studs

(a) Shear connector studs shall conform to the requirements of Appendix H, CSA W59-M1989 and of ASTM A108, Grade 1020 and shall be of a design suitable for end welding using automatic stud welding equipment.

E26.5 Construction Methods

E26.5.1 Fabrication Procedures and Tolerances

(a) General

(i) Except as otherwise specified herein, steelwork shall be fabricated in accordance with the latest A.W.S. Specification D1.1 and subsequent revisions.

(ii) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(iii) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(iv) If damage occurs to the structural steel during fabrication, the Contract Administrator shall be notified immediately. The Contractor shall submit remedial method statement. Remedial repair measures are subject to the approval of the Contract Administrator.

(v) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(vi) Steel shapes and plates shall be cut and fabricated so that the direction of the applied stress shall be parallel to the direction of plate rolling.

(vii) Oxygen cutting shall be in accordance with AWS D1.5 and CSA W59.

(viii) All holes for connections of pier beams and diaphragms shall be drilled or sub-punched and reamed using steel templates. Templates shall be located with utmost care as to position and angle and firmly bolted in place.

(b) Procedures and Tolerances

(i) Shearing of plates shall only be permitted on edges of secondary material which will be welded; all edges of primary material must be machine flame cut or, if sheared, must be planed to a depth of ¼" (6 mm).

(ii) All holes must be drilled from the solid or sub-punched a maximum 11/16" (18 mm) diameter and reamed.

(iii) Camber in girders shall be as indicated on the Drawings. Deviation from camber in girders shall not be permitted.

(iv) Bottom flanges of girders over bearings shall be true and square. Maximum measured deviation at outside edge of bearing plates shall not exceed 1/25" (1 mm).

(v) Deviations from straightness of main girders shall not exceed 1/8" (3 mm).

(vi) Field connections and bolts for connection plates:

- supply all bolts for shop and field connections as called for on the Drawings;
- the Fabricator shall supply additional high strength connection bolts for field assembly. The number of field high strength bolts of each size and length furnished in excess of the nominal number required shall be five percent (5%) plus 5. The number of nuts and washers of each size and type furnished in excess of the nominal number required shall be five percent (5%);
- all shop & field connections shall be slip-resistant (friction-type) using High Strength bolts;
- bolts shall conform to ASTM F3125M, Grade A325, Type 1, with matching nuts to ASTM A563 Grade DH3 and washers to A.S.T.M. F436, Type 1;
- contact surfaces shall be thoroughly cleaned of all weld deposits and dirt prior to assembly of components in order to obtain the desired friction component; and,
- tightening of high strength bolts shall be executed by the turn-of-nut method as specified under CSA/S16.

(vii) Assembly

- Complete shop assembly required to ensure good fit of all parts in the field and match mark all parts. Ship completely knocked down for assembly in the field.

(viii) For inspection purposes, all bolts must have their snug tight positions marked by the Fabricator prior to final tightening.

(ix) All miscellaneous steel pieces should be bundled and clearly marked as called for on the identification of pieces drawing

(c) Finish

(i) All portions of the Work shall be neatly finished. Shearing, cutting, chipping and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

(d) Holes

(i) General

- Except where a specific method of holing materials is shown on the Drawings or required in the Special Provisions, all holes shall be either drilled or sub-punched and reamed. Poor matching holes will be cause for rejection.

(ii) Punched Holes and Slots

- For holes and slots punched full size, the diameter or size of the die shall not exceed that of the punch by more than 2 mm. All holes and slots which are punched shall have burrs and sharp edges removed. All holes shall be clean-cut without torn of ragged edges. The punching shall not distort the structural member. If required by the Contract Administrator, a sample of the punching operation shall be carried out to the satisfaction of the Contract Administrator prior to the start of fabrication.

(iii) Drilled Holes

- Drilling shall be done with twist drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.

(iv) Sub-Punched and Reamed Holes

- All holes shall be sub-punched or sub-drilled to a diameter 5 mm smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.

(v) Allowable Tolerance for Holes

- All matching holes for bolts shall register with each other so that a gauge 2 mm less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The centre-to-centre distance between any two holes of a group of holes shall not vary by more than 1 mm from the dimensioned distance between such holes. The centre-to-centre distance between any group of holes shall not vary by more than the following tolerances unless shown otherwise on the Drawings:
  - Centre-to-centre 12 m or less 1.0 mm;
  - Centre-to-centre over 12 m to 18 m 1.5 mm;
  - Centre-to-centre over 18 m to 24 m 2.5 mm;
  - Centre-to-centre over 24 m 3.0 mm; and,
  - Miss-punched or miss-drilled members shall not be corrected by welding.

(e) Match Marking

(i) Connection plates to stiffency plates and girders shall be shop checked for fit and match marked.

(f) Welding

(i) Specifications

- Welding shall conform to the requirements of the Structural Welding Code - Steel of the American Welding Society AWS D1.5 and addendum and CSA W59 Welded Steel Construction.

(ii) Welding of principal members shall be performed by automatic or semi-automatic submerged arc process, in accordance with CSA Standard W59, Welded Steel Construction or AWS D1.5.

- Gas metal-arc, electrogas, and electroslag welding are not permitted.

(iii) Arc strikes and tack welds, which will not be incorporated into the final welds as shown on the approved drawings, will not be permitted. Tack welds are to be not longer than 70 mm (2 ¾"), not closer than 500 mm (20") and no larger than 5 mm (3/16").

(iv) Exact shop welding procedures, including weld sizes, stress relief treatment, types of electrodes, flux, current, and sequence of welding shall be submitted for the Contract Administrator's review. Any standard sheets submitted for review shall be marked up to indicate clearly the type of weld to be used for every particular application. The welding procedures used shall be indicated on Fabricator's Shop Drawings by cross-referencing them with the standard sheets submitted.

(v) Welding Procedures and Qualification

- Welding procedures that conform in all respects to the approved procedures of AWS D1.5 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications.
- Welding procedures that do not conform to approved procedures in AWS D1.5 and CSA W59 shall be qualified by tests carried out in accordance with AWS D1.5. The Contract Administrator may accept previous qualifications of the welding procedure.

(vi) All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.

(vii) Distortion and Shrinkage Stresses

- Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of 120°C, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.5 and CSA W59 shall be followed in the control of distortion and shrinkage stresses.

(g) Hot-Dip Galvanizing

(i) Shop Applied:

- the galvanizing shall be shop applied and strictly in accordance with ASTM A123 and CSA Standard G164 to a minimum net retention of 610 g/m2.;
- 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;
- submit a hot-dip galvanizing plan for the steel girder galvanizing outlining the process, methods, responsibilities and all things necessary to avoid steel embrittlement in accordance with ASTM A143/ A143M. The Plan shall identify the methods the fabricator and galvanizer shall undertake to avoid the occurrence of strain-age embrittlement. The Plan shall also include a communication plan between the fabricator and galvanizer throughout fabrication and galvanizing process to ensure best practices are used throughout to minimize the possibility of strain-age embrittlement;
- 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; and,
- furthermore, no underlying cracking and other visible damage or deterioration of the hot-dip galvanizing as a result of handling or bending operations, or any other cause, shall be galvanize-coated with field applied galvanizing touch-up material as specified hereinafter.

(ii) Field Applied Touch-up Galvanizing

- Any areas of damaged galvanizing shall receive field applied touch-up galvanizing.
- Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants.
- For self-fluxing, low temperature, zinc based alloy rods, preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field applied galvanizing shall be blended into existing galvanizing of surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.
- For pure zinc paint on systems, the approved product Zinga shall be applied by either a brush or roller. The Zinga shall be applied in 3 coats, with each coat having a dry film thickness of 60 µm (2.36 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.
- The maximum area to be repaired in the field on a single repair 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.

(iii) Surface Preparation and Cleaning

- Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A123, CSA G164 and SSPC Specification SP:10, "Near White Metal Blast Cleaning", unless otherwise specified herein. The Contractor shall ensure that all exterior surfaces of structural steel are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 610 g/m^2. All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.
- 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 of oil and grease shall be removed with solvents prior to blasting or pickling.
- The sandblasting and cleaning of structural steel members shall be done in the shop.
- After the structural steel members have been sandblasted and cleaned, the Contract Administrator will carry out a visual inspection of the structures in the shop before they are shipped to the galvanizing plant.

E26.5.2 Handling, Delivery and Storage of Materials

(a) Precautionary measures shall be taken to avoid damage to structural steel during handling, transit, stockpiling and erecting. The use of chains and metal cable slings for lifting is forbidden. If use of metal chains or slings cannot be avoided, adequate protections as authorized by the Contract Administrator shall be applied to the part to be lifted so as to prevent any contact between the sling and the span. Parts may not be dropped, tossed or dragged during vehicle loading and unloading. Pinholes, or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of steel beams. The only acceptable method of shipment or storage of beams, if not uniformly supported for their entire length, is a method which allows the beams to rest on the bottom faces of the bottom flanges, at or near actual points of support in the erected position. All parts of bearing assemblies shall be separated and secured effectively before shipping in order to avoid damage in transit. Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

(b) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the structural steel. The materials shall be kept

separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

(c) When transporting bridge girders using equipment other than a flatbed trailer, the Contractor shall be responsible for ensuring the following:

(d) The Contractor shall submit the temporary traffic control plan in accordance to all jurisdictions and regulation procedures, as part of the handling, delivery and storage of materials. The proper advance signing must also be in place.

E26.5.3 Protective Blocking

(a) Provide protective blocking for lifting and transportation. Exercise care during fabrication and transportation so as not to damage span and, in particular, to avoid notches to edges of members, which may cause cracks due to fatigue stresses.

(b) When girders are galvanized, all lifting/handling/blocking shall be done with non-metallic components such that the galvanizing is not damaged.

(c) The use of welded attachments of any type, the field drilling or burning of holes, in any member, for shipping, or any other purpose is strictly forbidden.

(d) Bolts shall not be loosened or removed from attachments in order to facilitate shipping.

E26.5.4 Handling, Storage and Loading

(a) Structural steel, either plain or fabricated, shall be stored upright above ground in a shored position on platforms, skids or other similar supports and shall be kept free from dirt and other foreign matter.

(b) Structural material, either plain or fabricated, shall be protected from corrosion.

(c) Long members shall be so supported as to prevent deflection.

(i) Structural Steel Girders

- The lifting devices shall be of such a nature as to avoid twisting, racking, or other distortions while handling, storing, moving and erecting the girders. The devices shown on the Drawings are minimum requirements and the Contractor and the Fabricator shall satisfy themselves as to the adequacy of the devices. The girders shall be picked up only by the lifting devices.
- The Fabricator shall be responsible for storage of the girders from the completion of their fabrication until they are required by the Contractor.
- During storage and hauling, the girders shall be maintained in an upright position and shall be supported at the bearing areas only unless otherwise approved in writing by the Contract Administrator. Extreme care shall be exercised during the handling and storage of the structural steel girders to avoid twisting, deflection or other distortion that may result in damage to the girder.

E26.5.5 Transportation and Delivery

(a) The structural steel fabricator shall schedule, coordinate and sequence structural steel transportation and delivery in cooperation with the erection of the structural steel by the structural steel erection contractor.

(b) The Contractor shall perform all work necessary to ensure safe loading, transportation, unloading and storage of structural steel. The Work shall consist of loading the structural steel at the Fabricator's plant, transporting the structural steel to the Site, and unloading and storing the structural steel at the Site, including temporary works for access.

(c) Structural steel shall be loaded for shipping in such a manner that it can be transported and unloaded at its destination in the correct orientation for erection without being excessively stressed, deformed, or otherwise damaged.

(d) Structural steel shall be stockpiled to avoid excessive stress deformation or other damage while stored.

(e) The transportation plan and schedule shall be provided to the Contract Administrator not less than seven (7) Days before any shipping begins.

(f) Structural Steel Girders

(i) When transporting bridge girders, the Contractor shall be responsible for ensuring that all of the required permits have been acquired and the conditions of all permits are met.

(ii) The Contractor shall submit his proposed route for transporting the girders including traffic control procedures as part of the proposed loading and transporting procedure. In all traffic control situations, the flagmen must be trained and properly attired in flagman's vest and approved headgear with approved flagman's stop/slow paddle or fluorescent red flag. The proper advance signing must also be in place.

(iii) No loose timber blocking will be permitted for use as temporary works for any aspect of girder handling, storage and transportation. Plate girders shall be transported with their webs in a vertical plane unless otherwise approved by the Contract Administrator.

(iv) It is the Contractor's responsibility to ascertain the actual weight of the girders.

E26.6 Quality Control

E26.6.1 General

(a) The Contractor shall be responsible for all quality control testing specified in the Specification and shall complete the minimum weld testing requirements using procedures and frequency of testing according to CSA W59 to verify that welds meet the quality requirements of the current edition of the CSA Standard W59 and AWS D1.5.

(b) All testing shall be completed by qualified personnel who are certified at the time of testing, in accordance with E26.6.3.

(c) Structural Steel

(i) All structural steel shall be free of surface imperfections, pipes, porosity, laps, laminations and other defects.

E26.6.2 Inspection

(a) The Contract Administrator will arrange for, and the City will pay for an independent inspection consultant to carry out shop inspection of the fabrication including non-destructive testing of the welds and any other tests deem necessary to complete the inspection. This will be in addition to the Fabricator's Quality Control Program.

(b) The Fabricator shall give two weeks" notice to the Contract Administrator at the beginning of work in the shops so inspection may be provided. No work in the shop shall be done until the Contract Administrator has been notified.

(c) The following inspections shall be carried out:

(i) Geometric Control
- Plate and Shape Sizes
- Dimensions
- Alignment
- Tolerances

(ii) Quality of Welds
- Non-destructive testing of welds shall be in accordance with CSA W59

(iii) High Strength Bolts
- Turn of the nut method or by torque wrench – one hundred percent (100%) sampling of installed bolts (site installed bolts are not included)

(iv) Surface Finishes

- Cleaning
- Galvanizing

E26.6.3 Non-Destructive Testing Agency and Personnel

(a) An independent testing organization shall be certified by the Canadian Welding Bureau (CWB) to the requirements of CAN/CSA W178.1 for bridge structures by radiographic, ultrasonic, magnetic particle, and liquid penetrant test methods to perform all non-destructive testing of the welds.

(b) All visual inspection of welds shall be performed in accordance with CAN/CSA W59 by a welding inspector certified by the CWB to the requirements of CAN/CSA 178.2 (Level II minimum) for bridges and structures.

(c) Non-destructive testing shall be done by a non-destructive testing technician certified to the Canadian General Standards Board (CGSB) in the test method specified and being performed by the Inspector.

(d) Neither the technician nor the independent testing organization shall be changed without the approval of the Contract Administrator.

E26.6.4 Non-Destructive Testing of Welds

(a) The Contractor shall, at their own cost, perform the inspections to verify that welds meet the quality requirements of the current edition of the CSA W59 and AWS D1.5-S and:

(i) all non-destructive testing performed by the Fabricator shall be done by personnel qualified under CSA W59 and/or AWS D1.5-S;

(ii) the Fabricator shall submit to the Contract Administrator, in triplicate, copies of all inspections and weld testing reports; and

(iii) welds requiring repairs shall be retested after repairs are made, at the expense of the Contractor.

E26.6.5 Radiographic, ultrasonic or magnetic particle testing shall be completed by the Independent Testing Agency appointed by the Contract Administrator using procedures and frequency of testing according to CSA W59.

E26.7 Quality Assurance

E26.7.1 All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

E26.7.2 All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

E26.7.3 The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works.

E26.7.4 The Contractor shall submit to the Contractor Administrator material traceability reports and non-destructive test results carried out as part of internal quality assurance in the plant if requested by the Contractor Administrator.

E26.7.5 Inspection of welds shall not be permitted until the material temperature has cooled to below 100 degrees Celsius

E26.7.6 The Contractor shall provide sufficient access and shop area to permit the performance of the tests. The Contractor shall give the Contract Administrator not less than 24 hours" notice of when work will be ready for testing, and such notice shall advise the Contract Administrator of the type and quantity of work which will be ready for testing. All defects

revealed shall be repaired by the Contractor at their own expense and to the approval of the Contract Administrator.

E26.8 Measurement and Payment

E26.8.1 Supply, Fabrication and Delivery of Structural Steel

(a) The supply, fabrication and delivery of structural steel will not be measured. This Item of Work shall be paid for at the Contract Lump Sum price for "Supply, Fabrication and Delivery of Structural Steel", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E27. ERECTION OF STRUCTURAL STEEL

E27.1 Description

E27.1.1 The Work shall consist of:

(a) unloading and erecting structural steel components (e.g. structural steel girders, plates, diaphragms, pier beams, base plates, nuts and washers, and all incidental structural steel elements.) as shown and described on the Drawings and in this Specification;

(b) design, supply, fabrication, installation, maintenance and removal of temporary falsework (where applicable);

(c) Design, supply, delivery, installation, maintenance and removal of erection bracing, temporary wind bracing, lateral stability bracing, longitudinal ties and other temporary works for structural steel girders; and,

(d) the quality control (QC) testing of all materials and the Work.

E27.1.2 The Contractor shall not erect the structural steel girders until the substructure concrete has cured a minimum of seven days and achieved eight percent (80%) of the twenty-eight (28) day specified concrete strength requirements. Schedule of lifts will need to be arranged in advance with date and time coordinated with the Protecting Foreman and Contract Administrator.

E27.2 References

E27.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Specification E26

(b) Specification E5

E27.3 Submittals

E27.3.1 The Contractor shall submit the following to the Contract Administrator, in accordance with the Specification:

(a) Structural Steel Erection Procedure

(i) A schedule and detailed plan clearly illustrating the method and sequence by which the Contractor proposes to unload and erect the structural steel. The structural steel erection procedure shall include detailed design notes and Shop Drawings in accordance with E4 and shall bear the seal of a Professional Engineer registered in the Province of Manitoba.

(ii) The structural steel erection procedures shall be sealed, signed and dated by a Professional Engineer, registered or licensed to practice in the Province of Manitoba necessary to describe the following and assume full responsibility that the design is being followed:

- access to work, including earth berms, work bridges, or rock berms. The Professional Engineer shall confirm that the temporary works can fully support all loads during structural steel erection;
- type and capacity of proposed equipment;
- sequence of operation, including position of cranes, trucks, and traffic accommodation;
- detailed crane position and location, particularly adjacent to substructure elements, such as piers and abutment backwalls, with details of load distribution on wheels and outriggers throughout each lift. If the Contract Administrator, approves the crane positioned on the structure during a portion of the Work, details of crane position on the structure showing wheel loads and axle spacing of equipment moving on structure shall also be submitted;
- loads and their position from crane wheels and outriggers during all positions of lifting when the crane(s) is on or adjacent to the structure;
- details of temporary falsework, including proposed methods to be used to ensure stability and the required splice elevations and structure shape and details of release (if applicable):
  - method of providing temporary supports for stability; and,
  - details of lifting of girders, showing vertical forces at lifting points and on the lifting devices.
- complete details of blocking for bearings where necessary to constrain movement due to horizontal forces and/or gravity effects;
- when applicable, complete details of longitudinal ties between the ends of girders at locations where the bridge will be made continuous. These ties shall be capable of resisting tension or compression that will develop due to temperature change, creep, and shrinkage. These shall be kept in place until the diaphragms have been installed and a majority of bridge deck concrete has been cast and reached specified strength;
- Grout Pad Construction, if applicable; and,
- provide an “As Constructed” detailed survey of the substructure showing the following:
  - location and elevation of all bearing seats;
  - shim height at each bearing location, if applicable;
  - top of girder elevations at each bearing (and each splice location where applicable); and,
  - safety and compliance with Manitoba Workplace Health and Safety Act and Regulations shall be integral to the girder erection procedure.

(b) Temporary Works

(i) Detailed design notes and Shop Drawings for proposed temporary works, including but not limited to erection bracing, temporary wind bracing and lateral stability bracing for structural steel girders shall be sealed signed and dated by a Professional Engineer, registered or licensed to practice in the Province of Manitoba.

E27.4 Construction Methods

E27.4.1 General

(a) The Contractor shall schedule, coordinate and sequence structural steel erection in cooperation with the delivery of the structural steel by the structural steel fabricator.

(b) Any structural steel components that in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at their own expense.

(c) If the structural steel components are stored on site, the requirements of E26.5.2, shall apply.

E27.4.2 Erection of Structural Steel Girders

(a) General

(i) Before taking possession and erecting the girders, the Contractor shall verify that the lengths of the girders, the layout of the substructure units, the elevations of the bearings seats, and the location of the anchor bolts are in accordance with the Drawings. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

(ii) It is essential that the girders be erected with utmost attention being given to girder positioning, alignment, and elevation. The Contractor shall adjust girder position, bearing location, and bearing elevation in order to achieve as closely as possible the lines and grades shown on the Drawings. The Contractor shall minimize any differential camber (girder to girder), and the sweep of the girders by jacking, loading of girders, winching, or whatever means are necessary, and shall provide the necessary temporary attachments to hold the girders in position. The Contract Administrator shall approve of all proposed methods of jacking, loading, winching, etc. prior to the work being undertaken.

(iii) Unloading and erection of the structural steel girders shall be under the direction of a Professional Engineer, registered or licensed to practice in the Province of Manitoba. The Professional Engineer shall be experienced in bridge girder erection and be present for all stages of the girder erection.

(iv) Loose timber blocking will not be permitted for use as temporary works for any aspect of girder erection.

(v) It is the Contractor’s responsibility to ascertain the actual weight of the girders.

(b) Equipment

(i) All cranes, rigging and equipment shall be in good condition and properly maintained at all times during the period of the work. All cranes, rigging and equipment shall be of sufficient capacity to complete every stage of the erection Works.

(ii) The Contract Administrator shall, at their discretion, verify capacity and state of equipment provided and any equipment found not meeting the requirements for erection work shall be removed and replaced. Slings and other lifting devices that will be in contact with structural steelwork shall be of a type, which shall not damage shop primed or painted surfaces.

(c) Erection

(i) The Contract Administrator shall be notified in writing of the starting date at least two (2) weeks prior to the commencement of field operations. Work shall not be carried out until the Contract Administrator is on the Site.

(ii) Components shall be lifted, placed, and maintained in position using appropriate lifting equipment, temporary bracing, guys, or stiffening devices so that the components are at no time overloaded, unstable, or unsafe. Additional permanent material may be provided, if approved by the Contract Administrator, to ensure that the member capacities are not exceeded during erection. The additional material shall be shown in the erection diagram.

(iii) Release of temporary supports or temporary members, etc. must be gradual, and under no circumstances will a sudden release be permissible.

(iv) Unless otherwise approved by the Contract Administrator, at least fifty percent (50%) of the holes in the joints shall be filled with drift pins or hand tightened bolts prior to removing the crane. At least fifty percent (50%) the bolts required in the flanges shall be installed. For roadway or railway overpass structures, drift pins shall not be left in place over traffic when the crane is removed.

(v) For temporary fit ups, main girder splices and connections shall be aligned with drift pins and a sufficient number of fitting up bolts shall be installed to maintain the integrity of the connection.

(vi) The fitting up bolts may be the high strength bolts used in the installation. Drift pins shall be 1 mm larger in diameter than the required bolts. Excessive drifting

that distorts the metal and enlarges the holes is not allowed. Reaming up to 2 mm over the nominal hole diameter is permitted, except for oversize or slotted holes.

(vii) Repairs to erected material will only be permitted after the repair procedure has been approved by the Contract Administrator.

(viii) Filling of misplaced holes by welding is permitted only with the written approval of the Contract Administrator.

(ix) Material intended for use in the finished structure shall not be used for erection or temporary purposes unless such use has been shown on the Shop Drawings, erection diagram, or authorized by the Contract Administrator.

(x) Hammering that will damage or distort the members is not permitted.

(xi) Surfaces that will be in permanent contact shall be cleaned immediately prior to assembly.

(d) Temporary Stresses

(i) The Contractor shall assume full responsibility for ensuring that all bridge member and component stresses are within permissible limits at all stages of the construction work. The Contractor shall provide all necessary additional steel reinforcement, bracing or other measures required to ensure that the erection procedures do not overstress any temporary or permanent member or component at any stage of the Work.

(e) Alignment and Camber

(i) The structural steel girders shall be erected to the proper alignment in plan and in elevation, taking into account the dead load camber shown on the Drawings. Members shall be aligned to the dimensional tolerances specified in CAN/CSA W59-M, but in no case, shall it deviate by more than 50 mm from the theoretical location.

(ii) Alignment shall be measured from survey lines joining the ends of any test length of a member.

(f) Temporary Bracing

(i) The Contractor shall be responsible for the design, supply, installation and removal of all:

- erection bracing;
- temporary wind bracing;
- lateral stability bracing; and,
- longitudinal ties.

(ii) As may be required during and immediately following the erection of structural steel girders.

(iii) The bracing shall be designed and installed so that it will not interfere with the installation of steel diaphragms.

(g) Lifting Devices

(i) After the Contract Administrator has approved the erection positions of the girders, all lifting devices shall be removed to the satisfaction of the Contract Administrator.

E27.4.3 Connections

(a) Holes made in the field shall be drilled or reamed. Shop reamed holes shall not be re-reamed in the field.

(b) At the time of erection, all connection plates shall be free of loose mill scale, burrs, and all contamination such as drilling shavings, oil, dirt, and paint.

(c) Surfaces to be in permanent contact shall be cleaned immediately prior to assembly.

(d) Any error in shop fabrication or any deformation resulting from handling or transportation that prevents the proper assembly and fitting of parts, especially splices of main structural members, shall be reported and the proposed method of correction

shall be submitted to the Contract Administrator. Corrective measures shall not commence until the submitted proposal is accepted by the Contract Administrator.

E27.4.4 Attachments

(a) The use of tack welds for securing temporary or permanent attachments that are not shown on submitted Shop Drawings, erection drawings or fabrication drawings shall not be permitted on any portion of girders or any other structural members.

E27.4.5 Bolted Construction

(a) The requirements of the Specifications for E26.5.1(b) shall apply.

E27.4.6 Removal of Falsework and Site Clean-up

(a) Upon completion of the erection and before final acceptance, the Contractor shall remove all temporary falsework. They shall remove all piling, excavated or surplus materials, rubbish and temporary supports, replace or renew any damaged fences, and restore in an acceptable manner all property damaged during the execution of the Work. Disposed of surplus materials shall be in a manner and at a location satisfactory to the Contract Administrator.

(b) The Contractor shall leave the bridge site, roadway and adjacent property in a neat restored and presentable condition, satisfactory to the Contract Administrator. When requested by the Contract Administrator, the Contractor shall provide written evidence that affected property owners and/or regulatory agencies have been satisfied.

E27.4.7 Protection of Components

(a) Restoration of Damaged Surface Coatings and Final Cleaning

(i) The Contractor shall repair all damaged surface coatings which, in the estimation of the Contract Administrator, are defective, including any damaged galvanized surfaces.

(ii) 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 316^{o}C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick (galvalloy) 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.

(iii) The process is to be repeated as required to achieve a thickness comparable to original galvanizing.

(iv) 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.

(v) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E27.5 Measurement and Payment

E27.5.1 The Erection of Structural Steel will not be measured. This Item of Work shall be paid for at the Contract Lump Sum price for “Erection of Structural Steel”, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E28. STEEL DECKING

E28.1 Description

E28.1.1 General

(a) This Specification covers all operations relating to the following:

(i) Design, supply, fabrication and erection of steel decking as shown or described on the Drawings and in this Specification.

(ii) Quality control of materials and fabrication.

(iii) Galvanizing of steel decking.

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

E28.2 References

E28.2.1 References and Related Specifications

(a) All related Specifications shall be current issued or latest revision at the first date of tender advertisement.

(b) CAN/CSA S136-07 (R2012), North American Specification for the Design of Cold Formed Steel Structural Members.

(c) ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

E28.3 Submittals

E28.3.1 The Contractor shall submit the following to the Contract Administrator, in accordance with the Specification:

(a) Manufacturer's product technical information for steel decking and all steel decking fixings confirming compliance with the Drawings and Specifications.

(b) Shop certificate confirming supplied steel decking meets material and galvanizing requirements.

E28.4 Materials

E28.4.1 General

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

E28.4.2 Sheet Steel

(a) Sheet steel for galvanized deck shall conform to ASTM A653 (A653M) structural quality, with a minimum yield strength of 230 MPa.

(b) The deck type (profile) and thickness (gaze) shall be as shown on the Drawings.

(c) The deck galvanizing shall be class Z600 for a minimum zinc coating coverage of 600 g/m2.

E28.5 Construction Methods

(a) The Contractor shall schedule, coordinate and sequence steel deck erection with the delivery of the steel decking.

(b) Store and handle steel decking and accessories to prevent damage to property and to existing structures.

(c) Avoid excessive storage time on site for steel deck materials. Stack steel deck tilted for water run-off. Use wood black spacers between each sheet.

(d) Any steel decking components that, in the opinion of the Contract Administrator, have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

E28.6 Erection

(a) Steel deck installation to be performed by its fabricator.

(b) Erect steel deck as shown on the Drawings and in accordance with CSA 5136.

(c) Locate steel deck units to bear on structural steel members at shear stud locations. Cut holes in steel deck to match shear studs.

(d) Avoid forcing units into place causing warpage or deflection.

(e) After alignment and levelling, secure deck to all steel support members as noted on the Drawings.

(f) All side interlocks to be mechanically clinched together at 600mm maximum spacing.

(g) Upon complete installation, remove surplus materials, rubbish, tools and equipment.

E28.7 Measurement and Payment

(a) The design, supply, fabrication and erection of Steel Decking will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for “Steel Decking”, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E29. STRUCTURAL BACKFILL

E29.1 Description

E29.1.1 The Works in this section include the following:

(a) Granular Backfill required behind the abutments and retaining wall, and under the sidewalk widening as shown on the Drawings and to the requirements of this Specification.

(b) For winter construction, heating of subgrade and granular backfill prior to placement.

E29.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E29.2 References

E29.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CW 3110 – Subgrade, Sub-Base, and Base Course Construction;

(b) CW 3170 – Earthwork and Grading.

(c) CW 3130 – Supply and Installation of Geotextile Fabrics

E29.3 Equipment

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

E29.4 Materials

E29.4.1 Granular Material

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

(b) All materials shall be accepted by the Contract Administrator at least fourteen (14) Days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

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

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

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

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

E29.4.2 Geotextile Fabric

(a) Geotextile fabric placed along the limits or within structural backfill shall be “Separation Geotextile Fabric” supplied in accordance with CW 3130.

(b) Supply of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

E29.5 Construction Methods

E29.5.1 Granular Backfill Material

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

(b) All granular backfill material shall be supplied, placed, and compacted in lifts of 150 m (maximum) to a minimum of 98% of Standard Proctor Dry Density, except for an area within 2.0 m from the back face of the wall shall be compacted to 92%of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time.

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

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

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

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

(g) All granular backfill material shall be placed and compacted before placement of structural concrete for the deck slab.

E29.5.2 Heating for Granular Backfill

(a) In locations of frozen subgrade, the Contractor shall preheat the subgrade prior to placement of granular backfill such that a minimum of 300 mm of unfrozen subgrade material is present during placement and compaction of granular backfill.

(b) The Contractor shall pre-heat all granular backfill such that it is placed and compacted in an unfrozen state.

(c) For subsequent lifts of granular backfill, the previous lift(s) will be considered the subgrade, and the requirements for unfrozen subgrade shall apply.

(d) Heating for Granular Backfill shall be considered incidental to Structural Backfill.

E29.5.3 Installing Geotextile Fabric

(a) Geotextile fabric shall be installed in accordance with CW 3130, and as shown on the Drawings.

(b) Installation of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

E29.6 Quality Control

(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.

(b) 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.

(c) 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.

E29.7 Measurement and Payment

(a) The backfilling required behind the retaining walls as shown on the Drawings will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Structural Backfill" which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E30. STRUCTURAL CONCRETE

E30.1 Description

(a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings.

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

E30.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ACI 309 – Guide for Consolidation of Concrete;

(ii) ACI 347 – Guide to Formwork for Concrete;

(iii) American Concrete Publication SP4 – Formwork for Concrete;

(iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;

(vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

(vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

(viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;

(ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;

(x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

(xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;

(xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;

(xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);

(xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);

(xv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;

(xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(xix) CAN/CSA O121 – Douglas Fir Plywood;

(xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;

(xxi) CAN/CSA S269.1 – False Work for Construction Purposes;

(xxii) CAN/CSA S269.3 – Concrete Formwork;

(xxiii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

(xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and

(xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

E30.3 Scope of Work

(a) The Work under this Specification shall involve the following structural concrete Works:

(i) Corbel beam;

(ii) Abutment seat;

(iii) Pier caps;
(iv) Bridge deck and curb;
(v) Jump slabs and curb;
(vi) Expansion joint blockout; and
(vii) Cast-in-place pile foundations.

E30.4 Submittals

E30.4.1 General

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

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

E30.4.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

(b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:

(i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;
(ii) Designated size, or sizes, of aggregates, and the gradation;
(iii) Aggregate source location(s);
(iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;
(v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;
(vi) The limits for slump;
(vii) The limits for air content; and
(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.

(d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator

may require the Contractor to make any necessary adjustments and associated resubmissions.

E30.4.3 Concrete Mix Design Test Data

(a) Concrete

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

(ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance with the requirements of the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6, Section 15, Fibre Reinforced Structures, Clause 16.6.

(iii) Testing for air void system shall be completed in accordance with E30.8.5(c).

(iv) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) Aggregates

(i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.

(iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

(iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

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

(vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.

(vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement

aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

(c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E30.4.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

E30.4.5 Temporary False Work, Formwork and Shoring Works

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(b) Design Requirements

(i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the precast concrete girders will not be accepted.

(iv) The loads and lateral pressures outlined in Part 3, Section 102 of ACI 347 and wind loads as specified by the Manitoba Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.

(v) As a minimum, the following spacings shall apply, for studding and waling:
- 20-mm plywood: studding 400 mm centre to centre (max.),
- Walers 760 mm centre to centre (max.)

(vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(vii) Formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(viii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

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

(xi) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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

(xiii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xiv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.

(c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. False work must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.

(d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E30.4.6 Bridge Deck Slab Pour Sequence and Schedule

(a) The Contractor shall submit to the Contract Administrator for review, at least ten (10) Business Days prior to the placement of concrete, details of the construction joints.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to scheduled commencement of concrete placement, the proposed concrete placement schedule for all other structural concrete placements of this Specification.

E30.5 Materials

E30.5.1 General

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

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

E30.5.2 Handling and Storage of Materials

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

E30.5.3 Concrete

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

(b) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table 31.1

TABLE 31.1 REQUIREMENTS FOR HARDENED CONCRETE							
Type of Concrete	**Location**	**Nominal Compressive Strength MPA**	**Class of Exposure**	**Air Content Category**	**Max Aggregate Size**	**Special Requirements**	**Minimum Post Residual Cracking Index**
Type 1	Cast-in-Place Piles	35 @ 28 Days	F-14, S-1	2	20 mm	-	-
Type 2	All Other Concrete	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15

E30.5.4 Working Base Concrete

(a) Working base concrete shall be placed in the locations as shown on the Drawings.

(b) Working base shall be concrete meeting the requirements of the latest edition and all subsequent revisions of CAN/CSA A23.1, for Class S-1 exposure, except as follows

(i) 20 MPa at 28 days.

(c) Supplying and placing working base concrete shall be considered incidental to the Work and no separate payment will be made.

E30.5.5 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.

(iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

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

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12.

(c) Coarse Aggregate - Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve

Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

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

(iii) Course aggregate when tested for abrasion in accordance with the requirements of the ASTM C131 shall not have a loss greater than 30%.

(iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E30.5.6 Admixtures

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

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

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

E30.5.7 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

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

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.

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

E30.5.8 Water

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

E30.5.9 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polylefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance to CHBDC CAN/CSA S6, “Fibre-Reinforced Structures”, Clause 16.6.

E30.5.10 Formwork

(a) Formwork materials shall conform to CAN/CSA A23.1, and American Concrete Publication SP4, “Formwork for Concrete”, unless noted otherwise on the Drawings.

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CAN/CSA “O121”. Approved Manufacturers are “Evans” and “C-Z.”

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

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

(f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E30.5.11 Form Coating

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

E30.5.12 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. This formwork liner shall be used on all exposed formed surfaces, except soffit surfaces, or where a normal form finish is specified.

(b) Paper-lined forms shall be used on all soffit surfaces, such as the jump slab. The Contractor shall provide conclusive evidence that the paper-lined form proposed for use will not stain or otherwise blemish the hardened concrete surface.

E30.5.13 Curing Compound

(a) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.

(b) Type 2 shall only be used on surfaces that will not be exposed to view.

(c) An approved product is WR Meadows 1215 WHITE Pigmented Curing Compound, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.14 Curing Blankets

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

E30.5.15 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

(i) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
(i) 1 part water;
(ii) 1 part latex bonding agent; and
(iii) 11/2 parts Type GUSF Portland cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E30.5.16 Epoxy Adhesive

(a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.17 Epoxy Grout

(a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.18 Cementitious Grout

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

E30.5.19 Patching Mortar

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

E30.5.20 Flexible Joint Sealant

(a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.21 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.22 Precompressed Foam Joint Filler

(a) Precompressed foam joint filler shall be “Emseal BEJS System” or “Emseal Submerseal” or “Emseal 2H” where shown on the drawings, satisfying the

requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(b) Precompressed foam joint filler shall be used around both ends of the jump slabs.

(c) The sealant system shall be comprise of three components:

(i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, waterbased emulsion, factory coated and highway-grade, fuel resistant silicone;

(ii) Field-applied epoxy adhesive primer; and

(iii) Field-injected silicone sealant bands.

(d) Impregnation agent shall have proven non-migratory characteristics. Silicone coating shall be highway grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. The depth of seal shall be as recommended by the Manufacturer.

(e) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plan and direction shall be executed using factory fabricated transition assemblies. Transitions shall be watertight at the inside and outside corners through the full movement capabilities of the product.

(f) All substitute candidates shall be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be:

(i) Capable of withstanding 65^{o}C for three (3) hours while compressed down to the minimum movement capability (-50% nominal material size) without evidence of any bleeding of impregnation medium from the materials; and

(ii) Capable of self-expanding to the maximum movement capability (+50% nominal material size) within twenty-four (24) hours at 20^{o}C.

E30.5.23 Ethafoam Joint Filler

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

E30.5.24 Low Density Styrofoam

(a) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.25 Backup Rod

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

E30.5.26 Void Form

(a) Void form shall be supplied by Void Form International, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.27 Anchor Rods

(a) Stainless steel anchor rods shall conform to the requirements of ASTM Specification A193 Grade B8M with yield strength of 517 MPa.

E30.5.28 Anchor Units for Aluminum Bicycle Rail

(a) Anchor units for aluminum bicycle rail shall be Acrow-Richmond Type DGRS-1.

E30.5.29 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E30.5.30 Benchmark Plugs

(a) Benchmark plugs shall be supplied by the City. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be shown on all Drawings.

E30.6 Equipment

E30.6.1 General

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

E30.6.2 Vibrators

(a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.

(b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel and stainless steel reinforcing, such as in locations that the existing deck reinforcing is exposed.

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

E30.6.3 Placing and Finishing Equipment for Bridge Deck Concrete

(a) Placing Equipment

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

E30.6.4 Placing and Finishing Equipment for Deck Concrete

(a) Placing Equipment

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

(b) Screed for Concrete Deck

(i) The Contractor may choose to use a mechanical or non-mechanical screed to strike the surface of the concrete deck slab.

(ii) Screed rails are required and shall be sufficient in number and length to ensure that the concrete cover is maintained and the finished elevation of the deck slab concrete meets the design elevations.

(iii) Screed guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

(iv) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.

(v) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.

(vi) Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.

(vii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).

(viii) The supply, setup, operation, and takedown of the screed for concrete deck slab shall be considered incidental to the placement of the concrete deck slab. No separate measurement or payment shall be made for this Work.

E30.7 Construction Methods

E30.7.1 General

(a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.

E30.7.2 Abutment Seats

(a) Abutment works shall comprise of the Work associated with the cast-in-place concrete for the abutment seats and backwalls at SU1 and SU10.

E30.7.3 Bridge Deck

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

E30.7.4 Corbel Beam

(a) Corbel beam works shall comprise of the Work associated with the cast-in-place concrete corbel beam, including the railing curb, on the sheet pile retaining wall.

E30.7.5 Pier Caps

(a) Pier caps works shall comprise of the Work associated with the cast-in-place concrete pier caps at SU2 and SU9, and shall also include the anchor rods.

E30.7.6 Jump Slabs

(a) Jump slab works shall comprise of the Work associated with the cast-in-place concrete jump slabs, including curbs.

E30.7.7 Cast-in-Place Piles

(a) Cast-in-place piles works shall comprise of the Work associated with the cast-in-place concrete pile foundation piers, in accordance with Specification E25.

E30.7.8 Expansion Joint Blockout

(a) Expansion joint blockout shall comprise of the Work associated with filling the blockouts with cast-in-place concrete at SU2 and SU9.

E30.7.9 Temporary False Work, Formwork, and Shoring

(a) Construction Requirements

(i) The Contractor shall construct false work, formwork and shoring for the new deck slab concrete strictly in accordance with the accepted Shop Drawings.

(ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the girders.

(iii) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted Shop Drawings.

(iv) Forms shall be constructed and maintained so that the completed Work is within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(vi) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No

openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

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

(ix) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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

(xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.

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

(c) The geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.

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

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

(f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour to match the surrounding concrete.

(g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

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

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

(j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the site by the Contractor

after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

E30.7.10 Concrete Construction Joints

(a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

(b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

(c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.

(d) Refer to, E16.7.27, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E30.7.11 Bridge Deck Screeds

(a) Setting Deck Screeds

(i) The Contractor shall adjust screeds to maintain the specified slab thickness. Adjust screed heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases shall be permitted to be drilled and grouted into existing concrete and shall be adjustable to achieve the required elevations.

(ii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E30.7.12 Curb Joints

(a) Finishing of Concrete Curb Joints

(i) Finishing of concrete curb joints shall be completed prior to application of any waterproofing membrane and asphalt overlay.

(ii) The installation of the precompressed foam joint filler and fibre joint filler shall be undertaken as shown on the Drawings.

(iii) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods. Polyethylene bond breaker tap shall be installed between joint fillers and sealants.

(iv) The precompressed foam joint filler shall be installed at barrier joints in accordance with the Manufacturer’s recommended methods to fully seal the joint.

(v) The supply and installation of all materials required for the curb joints shall be considered incidental to the Work, and no additional measurement or payment shall be made for this work.

E30.7.13 Permeable Formwork Liner

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

(b) The permeable formwork liner shall be used for only one (1) application.

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

E30.7.14 Control Joint Seals

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

E30.7.15 Benchmarks

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

E30.7.16 Stainless Steel Anchor Rods

(a) Anchor rods shall be installed as shown on the Drawings.

(b) The installation of anchor rods shall be considered incidental to bridge deck works.

E30.7.17 Anchor Units for Aluminum Bicycle Rail

(a) All anchor units shall be installed as shown on the Drawings.

(b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.

(c) The Contractor shall coordinate the installation of aluminum bicycle rail posts as described in E37, “Aluminum Bicycle Rail”.

E30.7.18 Electrical Conduit

(a) The Contractor shall coordinate the installation of all conduits, pull boxes and junction boxes for the lighting electrical embedded Work as described in Division 26 – Electrical.

E30.7.19 Supply of Structural Concrete

(a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.

(b) All mixing of concrete must meet the provisions of CAN/CSA A23.1, Clause 5.2, Production of Concrete.

(c) Time of Hauling

(i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.

(ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.

(iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.

(iv) Unless otherwise noted in Table E14.1, “Requirements for Hardened Concrete”, no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional

water meets the requirements of CAN/CSA A23.1 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Owner upon request.

(d) Delivery of Concrete

(i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

(i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:

i. Limit the amount to be placed at any time (using adequate construction joints);
ii. Augment his facilities and Plant in order to complete the proposed placement;
iii. In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and

(ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E30.7.20 Preparation for Concreting Against Hardened Concrete

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

(i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.

(ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.

(iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

(iv) For the Bridge traffic and median barriers, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E30.7.21 Placing Structural Concrete

(a) General

(i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.

(b) Placing Structural Concrete

(i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.

(ii) The nomograph, Figure D1, Appendix D of CAN/CSA A23.1 shall be used to estimate surface moisture evaporation rates.

(iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.

(iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.

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

(vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.

(vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or “cold joints” within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.

(ix) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

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

(xi) 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.

(xii) 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.

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

(xiv) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

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

E30.7.22 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

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

(b) Type 1 Finish – Exposed Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, finishes, but excluding soffit surfaces where an architectural form finish is specified.

(ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

(iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.

(iv) The surfaces shall be patched as specified in this Specification.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces shall be finished as outlined hereinafter.

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish - Surfaces Below Finished Grade

(i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E30.5.19 “Patching Mortar”, E30.5.15 “Bonding Agents”, and E30.7.25 “Patching of Formed Surfaces” of this Specification.

(e) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

(ii) The supply, set up, operation, and finishing of working base concrete shall be considered incidental to the placement of working base concrete, and no separate measurement or payment shall be made for this Work.

E30.7.23 General Curing Requirements

(a) Refer to E30.7.26, “Cold Weather Concreting” for cold weather curing requirements and E30.7.27, “Hot Weather Concreting” of this Specification for hot weather curing requirements.

(b) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of 24 hours. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.

(c) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.

(d) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.

(e) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

(f) Immediately following finishing of the deck and jump slab concrete, apply fog misting until the concrete has enough strength to support the placement of the predampened curing blankets. The misting device shall not be used to apply water to the concrete’s surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water. Failure to apply wet curing blankets within 40 minutes after the deck slab concrete has been deposited shall be cause for rejecting the Works. Concrete in the rejected area shall be removed and replaced at no additional cost to the City.

(g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator. Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.

(h) For curing of corbel beams, formwork shall remain in place for seven (7) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

(i) The jump slab shall be moist cured in accordance with E30.7.23(e).

(j) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly and by roller.

(k) Where curing compound is permitted, and following the completion of finishing operations, the surface shall be sprayed with an initial coating of curing compound, in accordance with the Manufacturer’s recommended methods. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

E30.7.24 Form Removal

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.

(b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.

(c) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E30.7.25 Patching of Formed Surfaces

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

(b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.

(c) Patching of formed surfaces shall take place within 24 hours of formwork removal.

(d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.

(e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

(g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E30.7.26 Cold Weather Concreting

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

E30.7.27 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

(ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.

(iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.

(iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.

(v) Sun shades and wind breaks shall be used as required during placing and finishing.

(vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

(vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.

(viii) Hot weather curing shall follow immediately after the finishing operation.

(b) Hot-Weather Curing

(i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.

(ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

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

(d) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table 14.3, “Acceptable Concrete Temperatures”, for the indicated size of the concrete section.

TABLE 14.3
ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, M	TEMPERATURES ^{0}C	
	MINIMUM	MAXIMUM
Less than: 1 1.2	 10 5	 27 25

E30.7.28 Cleanup

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

E30.8 Concrete Quality

E30.8.1 Inspection

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously

given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E30.8.2 Access

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

E30.8.3 Materials

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

(b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.

(c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.

(d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E30.8.4 Quality Assurance and Quality Control

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

(b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

(f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. An outline of the quality tests is indicated below.

E30.8.5 Concrete Testing

(a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E12.4.2, “Concrete Mix Design Requirements” of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the

measured air content falls outside the limits in, E19.4.3, “Concrete Mix Design Statement” of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(d) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method A23.2-1C, "Sampling Plastic Concrete".

(e) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".

(f) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

(g) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table 15.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E30.8.6 Corrective Action

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

E30.9 Measurement and Payment

E30.9.1 Structural Concrete

(a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:
Supply and Place Structural Concrete:
(i) Corbel Beam and Curb;
(ii) Abutment Seat;
(iii) Pier Caps;
(iv) Bridge Deck and Curb;
(v) Jump Slabs and Curb; and
(vi) Expansion Joint Blockout.

(c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Place Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

(d) The supply and placing of structural concrete for the cast-in-place pile foundations shall be paid for under Specification E25.

E31. SUPPLY AND PLACING REINFORCING STEEL

E31.1 Description

(a) This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of galvanized steel reinforcing, black steel reinforcing and stainless steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

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

E31.2 Scope of Work

(a) The Work under this Specification shall involve supplying and placing all steel reinforcing, as shown on the Drawings for the following Works:

SCOPE OF WORK	
Item	**Type of Steel Reinforcing**
Corbel Beam	Black Steel Reinforcement
Bridge Deck Slab and Curb	Galvanized Steel Reinforcement
Pier Caps	Stainless Steel Reinforcement
Corbel Beam Curb	Stainless Steel Reinforcement
Jump Slabs and Curb	Galvanized Steel Reinforcement
Abutment Seat	Black Steel Reinforcement
Abutment Backwall	Stainless Steel Reinforcement
Concrete Pile Foundations	Black Steel Reinforcement

E31.3 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
(i) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;
(ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
(iii) ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
(iv) ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings;

(v) ASTM A767/A767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement;

(vi) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(vii) CAN/CSA G30.18-M92 – Billet Steel Bars for Concrete Reinforcement;

(viii) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and,

(ix) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E31.4 Submittals

E31.4.1 General

(a) At least twenty-one (21) Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its Operators shall be submitted to the Contract Administrator for review and approval.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to commencement of any schedule Work on the Site, a proposed schedule, including methods and sequence of operations.

(c) The Contractor shall submit to the Contract Administrator for review, at least fourteen (14) Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.

(d) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on site.

(e) Contractor to submit Quality Control Testing Program to the Contract Administrator in accordance with E31.7.

(f) Contractor to submit Shop Drawings (including bar lists) in accordance with section E3 and the latest edition of the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

E31.5 Materials

E31.5.1 General

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

(b) Bundles of reinforcing steel shall be identified by tags containing bar marks.

(c) The reinforcing steel shall not be placed directly on the ground. Sufficient timber pallets or blocking shall be placed under the reinforcing steel to keep them free from dirt and mud.

E31.5.2 Handling and Storage of Stainless Steel Reinforcing

(a) Stainless steel reinforcing shall be stored separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

(b) Chains for steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Wood or approved alternate should be used to protect the bars

(c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.

(d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

E31.5.3 Reinforcing Steel

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

(b) All black reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.

(c) Stainless steel reinforcing as shown on the Drawings shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E31.1, "Type of Stainless Steel Reinforcing". Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

(d) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.

(e) 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 and ASTM A955M.

TABLE 31.1
TYPE OF STAINLESS STEEL REINFORCING

Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205	Duplex 2205	S31803
Type 2304	Duplex 2304	S32304

E31.5.4 Galvanizing

(a) Shop Applied

(i) 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.

(ii) 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.

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

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

(v) 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.

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

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

(viii) 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.

(b) Field Applied

(i) Field applied galvanized coating shall be brush applied:

(ii) Zinga, as supplied by Pacific Evergreen Industries Ltd., West Vancouver, BC, Canada (604) 926-5564.

(iii) ZRC Cold Galvanizing Compound, as supplied by ZRC Worldwide, 145 Enterprise Drive, Marshfield, MA 02050 USA (781) 319-0400.

(iv) Or equal as acceptable by the Contract Administrator.

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

(vi) 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.

E31.5.5 Bar Accessories

(a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.

(c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

(d) Placing of bar supports shall be done to meet the required construction loads.

(e) Tie wire shall be the following:

(i) Black, soft-annealed 1.6 mm diameter wire or Nylon coated wire for black steel reinforcing;

(ii) Nylon coated wire or 1.6 mm galvanized coated wire for hot-dipped galvanized steel reinforcing; and,

(iii) Stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.

(f) 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 in accordance with B7.

(g) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E31.5.6 Mechanical Splices

(a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, Type 316L, Type 2005, or Type 2304.

E31.6 Construction Methods

E31.6.1 Fabrication of Reinforcing Steel

(a) General

(i) 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.

(b) Black Steel Reinforcing

(i) Heating shall not be used as an aid in bending black steel reinforcing.

(ii) Hooks and bends should be smooth and not sharp.

(iii) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.

(c) Stainless Steel Reinforcing

(i) Heating shall not be used as an aid in bending stainless steel reinforcing.

(ii) Hooks and bends should be smooth and not sharp.

(iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.

(iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel wire brushes only.

(v) All hand tools shall be stainless tools that have not been used on carbon steel.

(d) Galvanized Reinforcing Steel

(i) 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.

(ii) Remove all welding slab, splatter, antisplatter compounds, and burrs prior to delivery for galvanizing.

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

(iv) 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.

(v) 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

E31.6.2 Placing of Reinforcing Steel

(a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.

(b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

(c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.

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

(e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. Bars with bends not shown on the Drawings shall not be used.

(f) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.

(g) 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.

E31.7 Quality Control

E31.7.1 Inspection

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

E31.7.2 Access

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

E31.7.3 Quality Testing

(a) Quality control testing may be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

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

E31.8 Measurement and Payment

(a) Supply and placing reinforcing steel bars shall be measured on a mass basis and shall be paid for at the Contract Unit Price per kilogram for the “Items of Work” listed here below which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted and measured by the Contract Administrator.

E31.8.1 Items of Work:

(a) Supply and Placing Reinforcing Steel

(i) Black Steel Reinforcing

(ii) Stainless Steel Reinforcing

(iii) Galvanized Steel Reinforcing

(b) The supply and placing of reinforcing steel bars for the cast-in-place concrete pile foundations shall be paid for under Specification E25.

E32. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

E32.1 Description

(a) This Specification shall cover the supply of labour, equipment, tools, and material necessary for the application of hot poured rubberized asphalt waterproofing on the bridge deck and jump slabs, as specified herein and as shown on the Drawings.

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

other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E32.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards:

(i) CAN/CGSB-27.9M – Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing;

(ii) CGSB-37-GP-50M – Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(iii) CGSB-37-GP-51M – Application of Hot Applied Rubberized Asphalt for Roofing and Waterproofing; and

(iv) CGSB-37-GP-56M – Membrane, Bituminous, Prefabricated and Reinforced for Rooting.

E32.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the concrete deck surface to receive the waterproofing membrane;

(ii) Applying primer to the concrete surface;

(iii) Placing the asphalt waterproofing membrane on the concrete surface;

(iv) Placing polyester fabric protection layers; and

(v) Supplying and installing wick drains and associated end drainage.

E32.4 Submittals

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

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

E32.5 Materials

E32.5.1 General

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

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

E32.5.2 Hot Poured Rubberized Asphalt Waterproofing

(a) The hot poured rubberized asphalt waterproofing system shall consist of the following compounds:

(i) Primer;

(ii) Hot applied rubberized asphalt waterproofing membrane; and

(iii) Polyester fabric.

(b) The hot poured rubberized asphalt waterproofing membrane shall be a two layer, fabric-reinforced system. Each layer shall be 2.0 to 3.0 mm in thickness. The intermediate fabric reinforcement shall be placed between the layers.

E32.5.3 Primer

(a) The entire concrete surface to be waterproofed shall receive a prime coat of CGSB37-GP-9Ma, 930-18 (BAKOR) or approved equivalent in accordance with B7, “Substitutes”, at an application rate in accordance with the Manufacturer’s recommended methods.

(b) Primer shall be stored at temperatures of 5C and above to facilitate handling. Materials shall be stored in a dry location and shall be kept in an upright position.

E32.5.4 Hot Poured Rubberized Asphalt Waterproofing Membrane (2 layers)

(a) The hot poured rubberized asphalt waterproofing membrane shall be Bemalastic 1213 BDM by Bemac products or 790-11 by BAKOR, or an approved equivalent, in accordance with B7, “Substitutes”.

(b) The waterproofing membrane shall be melted, mixed, and applied according to the Manufacturer’s recommendations.

(c) The layering operation shall be such that the waterproofing membrane is applied in two 2.0 – 3.0 mm thick layers.

(d) Discontinuities in the waterproofing membrane shall be avoided and joints lapped a minimum of 150 mm. The waterproofing membrane shall be applied to the entire bridge deck surface and north abutment roof slab (excluding approach slabs) and shall extend up the face of the barriers to the top (proposed elevation) of the asphalt pavement.

(e) At the Contract Administrator’s discretion, samples from the kettles shall be tested by the Contractor.

E32.5.5 Polyester Fabric

(a) An intermediate reinforcing layer shall be placed between the layers of waterproofing membrane. The intermediate reinforcing layer shall be spun-bonded polyester fabric such as Reemay 2016 grade, BAKOR Polyester Fabric Reinforcing Sheet, McAsphalt Fabric Reinforcement BP-16 or approved equivalent in accordance with B7, “Substitutes”, and set into the first layer of waterproofing membrane to achieve a minimum of 50% bleed through. Maximum overlap or gap between sheets of 6 mm.

E32.5.6 Surface Conditioner

(a) Surface conditioner shall be applied to the concrete surfaces of the deck and shall conform to the Manufacturer’s recommended methods.

E32.5.7 Wick Drains

(a) Wick drains shall consist of composite polypropylene with a total thickness of 3.6 mm, supplied in widths of 100 mm.

(b) The puncture strength shall be a minimum of 0.45 kN, measured in accordance with the requirements of the latest edition of ASTM D4833.

(c) Wick Drain shall be one of the approved products: American Wick Drain and distributed by Layfield and Nilex Inc. under private labels Nilex NuDdrain MD7407 and Layfield Wick Drain Type 1, or an approved equal as accepted by the Contract Administrator in accordance with B7, “Substitutes”.

(d) The rubber membrane shall consist of butyl rubber with a total thickness of 1.2 mm.

(e) Rubber membrane shall be one of the approved products: Elastoshet 6147, BP47 Elastomeric Reinforcement, BAKOR 990-25, or an approved equal as accepted by the Contract Administrator in accordance with B7, “Substitutes”.

E32.6 Equipment

E32.6.1 General

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

E32.7 Construction Methods

E32.7.1 General

(a) No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

(b) Temporary protection of the membrane shall be provided to prevent mechanical damage or damage from spillage of oil or solvents until such time as permanent protection is provided.

E32.7.2 Melting On Site

(a) Cakes of rubberized asphalt waterproofing shall be melted in an approved double shell melter under continuous agitation until the material can be drawn free flowing and lump free from the melter.

(b) The temperature of the rubberized asphalt waterproofing shall not exceed 218C at any time during the entire melting procedure.

E32.7.3 Application

(a) The entire concrete surface area onto which the hot poured rubberized asphalt waterproofing is to be applied shall be thoroughly cleaned by means of sand blasting. The sand blasted surfaces shall be sound, free from curing compounds, laitance, and scaling. All rough spots, ridges and edges in the concrete surface resulting from protrusions of concrete aggregate or cement paste shall be removed by light chipping or grinding to leave a smooth and level surface. Immediately prior to the application of the hot poured rubberized asphalt waterproofing, a final cleaning of the concrete surfaces shall be done using high velocity compressed air. The concrete surfaces shall be dry, clean, and free from frost, dust, dirt, and all foreign matter. The Contractor shall contain and collect all products of the sand blasting operation including dust, debris, and spent abrasive so as to ensure that all of these materials are prevented from entering into and being deposited into the Red River. All debris and spent abrasive shall be collected and disposed of off-site by the Contractor at a proper disposal facility. The Contractor is responsible for the preparation of the concrete surfaces to ensure that the hot-poured rubberized asphalt waterproofing can be installed in accordance with the Manufacturer's requirements.

(b) The Contractor shall ensure that the concrete surfaces onto which the hot poured rubberized asphalt waterproofing is to be applied is prepared (including supply and application or waterproofing primer) to the degree that the hot poured rubberized asphalt waterproofing can be installed in accordance with the Manufacturer's requirements.

(c) After the concrete deck has been cleaned, they shall be covered with surface conditioner. The quantity used shall be 160 mL/m_2, or as recommended by the Manufacturer. The surface conditioner shall be allowed to dry before the application of the rubberized asphalt waterproofing.

(d) The primer shall be applied at a uniform rate, as recommended by the Manufacturer, avoiding over-spraying or ponding of material. The primer shall be dry before applying the rubberized asphalt waterproofing.

(e) The rubberized asphalt waterproofing shall be brought to a temperature of between 190C and 218C.

(f) The application of the rubberized asphalt waterproofing shall be carried out under the supervision of experienced personnel.

(g) Apply membrane in a smooth fashion, free from air pockets, wrinkles, or tears, and in accordance with the Manufacturer's recommended methods. Ensure full bond of membrane to substrate.

(h) Apply the first layer of hot rubberized asphalt membrane evenly to a minimum thickness of 2mm to form a continuous monolithic coating over horizontal and vertical surfaces.

(i) Apply fabric reinforcing sheet and firmly press into first layer of hot membrane. Overlap fabric approximately 6mm ensuring that a layer of membrane is present between overlaps. Apply a second layer of membrane over the fabric to a minimum thickness of 3mm.

(j) The Contractor shall supply and install an elastomeric sheet membrane which is compatible with the hot-poured rubberized asphalt waterproofing material. The elastomeric sheet membrane shall be installed at the designated locations shown on the Drawings. Installation of the heavy-duty elastomeric sheet membrane shall be in accordance with the Manufacturer's recommendations.

E32.7.4 Installation of Wick Drains

(a) Wick drains shall be installed along the full length of the bridge deck at the interface between the bridge deck and bridge traffic barrier.

(b) Wick drains shall be installed when the hot poured rubberized asphalt waterproofing membrane is still hot and tacky.

(c) Special attention shall be given to waterproofing and wick drain modifications at deck drain pipe locations.

(d) Tack coat shall not be applied to wick drains.

E32.8 Quality Control

E32.8.1 Inspection

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E32.8.2 Access

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

E32.9 Measurement and Payment

E32.9.1 Hot-Poured Rubberized Asphalt Waterproofing

(a) Hot-poured rubberized asphalt waterproofing shall be measured on an area basis and paid for at the Contract Unit Price per square metre for "Hot-Poured Rubberized Asphalt Waterproofing", 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, accepted and measured by the Contract Administrator.

E33. SUBDRAIN SYSTEMS

E33.1 Description

E33.1.1 General

(a) This Specification covers all operations relating to the supply and installation of the subdrain pipe and wall drain systems located behind the sheet pile retaining wall, including associated accessories, as shown on the Drawings.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of the 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.

E33.2 Material

E33.2.1 General

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

E33.2.2 Drain Pipes, Fittings, and Accessories

(a) Drain pipes, fittings and other accessories and appurtenances for substructure drain pipe systems shall be 150 mm diameter, Schedule 40 PVC, with holes 12 mm in diameter, spaced at a maximum of 150 mm o/c; subdrain pipe shall have two rows of holes: pipe holes shall be positioned at 4 o'clock and 8 o'clock; holes may be aligned or alternating; and

(b) All other drain pipes, fittings, and other accessories and appurtenances shall conform to the requirement of CW 2130.

E33.2.3 Drainage Fabric

(a) Drainage fabric shall be in accordance with CS 3120-R4 or as accepted by the Contract Administrator in accordance with B7.

E33.2.4 Sheet Drain

(a) Sheet drain materials shall be Nudvain DN50-1 or equal as accepted by the Contract Administrator in accordance with B7 "Substitutes".

E33.2.5 Drainage Material

(a) Drainage material shall be in accordance with Specification CW 3120-R4.

E33.2.6 Equipment

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

E33.3 Construction Methods

E33.3.1 Subdrain Systems

(a) Install a perforated drain pipe system as shown on the Drawings. The supply and installation of this drain pipe system shall include the drain pipe, all required fittings, drain pipe drainage materials, and the filter fabric; and

(b) The drain pipe shall be laid to the line and grade shown on the Drawings, with the separate sections securely jointed together by means of watertight solvent welded joints or watertight rubber bell-and-spigot joints, with the bell on the downstream side of the connection. All bent joints shall be solvent welded. All clean-out pipes shall be solvent-welded to the main subdrain pipe. Tee connections are not permitted.

(c) Clean-out caps shall be thread-connected to clean-out pipes, and secured by 50 mm x 50 mm square nuts.

(d) Sheet drain materials shall be applied to all buried surfaces as shown on the Drawings.

E33.4 Measurement and Payment

E33.4.1 Subdrain Systems

(a) The Subdrain Systems will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the "Subdrain Systems", which price shall be payment in full for supplying all materials and for completing all operations herein described and

all other items incidental to the work included in this Specification and accepted by the Contract Administrator.

E34. BEARINGS

E34.1 Description

(a) This Specification shall cover the supply and installation of the bearings, steel plates, shear blocks, and anchor rods for the proposed bridge.

(b) The work to be done 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.

E34.2 Scope of Work

E34.2.1 The Work shall consist of:

(a) Supply, fabrication, delivery and installing bearings, steel plates, fasteners, anchor rods, and grout as shown on the Drawings and in this Specification.

(b) Quality control of materials and fabrication.

(c) Galvanizing of steel components.

E34.3 References

E34.3.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) 0 Supply, Fabrication and Delivery of Structural Steel for Treetop Lookout; and

(b) 0 Supply, Fabrication and Erection of Miscellaneous Metal.

E34.4 Material

E34.4.1 General

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

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

E34.4.2 Materials

(a) Bearing Pads

(i) The bridge bearing pads shall be supplied and installed by the Contractor as shown on the Drawings.

(ii) Pier Bearing Pads: Bearing pads shall be Laminated Elastomer pads as shown on the Drawings. Bearing pads shall have Shore A hardness of 60 Durometer.

(iii) Abutment Bearing Pads: Bearing pads shall be Natural Elastomeric pads as shown on the Drawings. Bearing pads shall have Shore A hardness of 60 Durometer.

(b) Grout

(i) Grout shall be non-metallic, non-shrink grout of a type approved by the Contract Administrator.

(c) Elastomeric Shims

(i) Elastomeric shims shall be neoprene, with a Shore A hardness of 60 Durometer and be 2mm and 3mm thick.

(d) Adhesive

(i) The adhesive for bonding the shims shall be a long lasting, high strength, cold applied, air cured, water and heat resistant material specifically formulated for bonding neoprene and shall meet the following requirements:

(a) Elastomer shall be moulded natural rubber, AASHTO low temperature Grade 5 with a Shore A Hardness of 60 and a shear modulus (G) between 0.90 and 1.1 MPa.

(b) Internal steel reinforcing plates for laminated bearings shall be rolled mild steel with a minimum yield strength of 300 MPa.

(c) Steel for bearing miscellaneous metal shall be in accordance with the latest edition of CAN/CSA G40.21, Grade 300W. This shall include plates and shear blocks as detailed on the Drawings. Other components associated with the bearings shall be in accordance with this Specification and Bill of Miscellaneous Metal for Bearings as shown and detailed on the Drawings.

(d) The internal steel plates shall be sand-blasted and cleaned of all surface coating rust, mill scale before bonding, shall be free of sharp edges and burrs, and shall have a minimum edge cover of 5mm of elastomer.

(e) Welding procedures shall be such as to minimize distortion of the bearing components and to avoid damage to finished work or bonded materials. All welding shall conform to the requirements of CSA Standard W59-03 (R208).

(f) The overall dimensions of the bearings shall be within a tolerance of +/- 3mm in plan and height.

(g) Stainless steel top plate shall conform to the latest edition ofA240A/240M Type 304 and shall have a minimum thickness of 3mm. The roughness of the stainless steel plate sliding surface, measured in accordance with CSA Standard B95, shall not be greater than 0.20 Mm arithmetic average. The stainless steel shall remain flat and in full contact with its backing plate at all times.

(h) PTFE surface shall be unfilled flat sheets made from pure virgin PTFE resin satisfying the requirements of the latest edition of ASTM D4894.

E34.5 Equipment

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

E34.6 Fabrication

(a) Shop drawings showing details of bearings, completed with laminated and non-laminated bearing pads and steel plates, shall be provided to the Contract Administrator for approval. Submission of shop drawings to the Contract Administrator in no way relieves the Contractor of his responsibility for the fabrication quality and accuracy and proper installation of the bearing pads as indicated herein in this Specification and on the Drawings.

E34.7 Construction Methods

E34.7.1 Bearings

(a) The bearings, complete with bearing retainer assemblies, shall be installed by the Contractor prior to placing the deck concrete.

(b) Before erection of the bearings, the Contractor shall satisfy himself that the location of substructure units and elevations of bridge seats are in accordance with the plans and specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

(c) Workmanship and finish shall be in accordance with plans and specifications and shall conform to the best practices of bridge construction. The parts shall be assembled as shown on the plans and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.

(d) The elastomeric bearings shall bear uniformly on all surfaces under full dead load. If uniform bearing is not present, the gaps beneath the bearing shall be filled with elastomeric shims. The Contractor, in the presence of the Contract Administrator, shall measure the gaps to determine the limits of the areas requiring shims.

(e) The Contractor shall raise the superstructure and install shims as required to provide uniform bearing of the bearings. The individual shims shall be bonded to the elastomer portion of the bearing with adhesive applied over the entire shim interface. The surface preparation, application and curing of the adhesive shall be in accordance with the manufacturer's recommendations. If shims in excess of 3mm are required, multiple shims shall be bonded together. Shimming of areas that vary in thickness shall be done by stepping the shims.

(f) All galvanizing shall be in accordance with CAN/CSA-G164-M and shall have a minimum net retention of 610 g/m^2. The fabricator and galvanizer shall safeguard against embrittlement using recommended practices from applicable standards. Seal all welds prior to galvanizing.

(g) All welding shall conform to AWS Specification D1.5.

E34.8 Measurement and Payment

E34.8.1 Supply and place bearings will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Supply and Place Bearings", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E35. EXPANSION JOINTS

E35.1 Description

(a) This Specification shall cover the supply and installation of expansion joints and miscellaneous steel items, as specified herein and shown on the Drawings.

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

E35.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;

(ii) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(iii) ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension;

(iv) ASTM D471 – Standard Test Method for Rubber Property – Effect of Liquids;

(v) ASTM D573 – Standard Test Method for Rubber – Deterioration in an Air Oven;

(vi) ASTM D1149 – Standard Test Methods for Rubber Deterioration – Cracking in an Ozone Controlled Environment;

(vii) ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness;

(viii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(ix) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding);

(x) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles; and

(xi) Ontario Provincial Standard Specification OPSS 1210 – Material Specification for Deck Joint Assemblies.

E35.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the expansion joints;

(ii) Supplying and installing the expansion joint seals;

(iii) Completing a watertight verification of the expansion joint seals;

(iv) Supply and installing the expansion joint cover plates and other miscellaneous steel items; and

(v) Seal welding the flange of the expansion joint edge members to the corner plates.

E35.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details and any proposed field splice details of the steel components of the expansion joints. The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall also be responsible for the expansion joint installation procedure.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used.

E35.5 Materials

E35.5.1 General

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

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

E35.5.2 Handling and Storage of Materials

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

(b) Store materials under cover in a dry and clean location off the ground.

E35.5.3 Expansion Joints

(a) Expansion joints shall be a strip seal type where and as shown on the Drawings.

(b) The expansion joints shall be Wabo Joint System “SE-500” strip seal system, as specified in the Drawings, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”.

(c) Expansion joints shall have fabricated cover plates and slider plates as shown on the Drawings.

(d) The seals at each joint shall be made out of neoprene, as accepted by the Contract Administrator and shall be supplied in one continuous piece, separate from the steel extrusions or joint. No shop or field splicing will be allowed in the seals.

(e) All fasteners and hardware of the modular bridge deck expansion joints shall be Grade 316, stainless steel.

E35.5.4 Steel

(a) Steel supplied for the fabrication of the expansion joints shall conform to the requirements of CAN/CSA G40.21, Grade 300W, or equal as accepted by the Contract Administrator, in accordance with B6, “Substitutes”. They shall be galvanized after shop fabrication in accordance with CAN/CSA G164-M92 to a minimum net retention of 610 g/m^2.

E35.5.5 Steel Extrusions

(a) Steel for the extrusions shall conform to the requirements of CAN/CSA G40.21, Grade 230G minimum.

E35.5.6 Anchor Studs

(a) Anchor studs shall conform to the requirements of ASTM A108, Grade Designation 1020 and shall be galvanized.

E35.5.7 Miscellaneous Steel Items

(a) Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to the requirements of CAN/CSA G40.21, Grade 300W and shall be galvanized in accordance with CAN/CSA G164 M92 to a minimum net retention of 610 g/m^2.

(b) The sidewalk cover plate shall be coated with an approved non-slip grit paint.

E35.5.8 Galvanizing Touch-up and Field Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(b) Approved products are:

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

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

E35.5.9 Welding

(a) Welding shall be of a low oxygen classification. Manual electrodes shall be E7016 or E7018. All welding shall be in accordance with CAN/CSA W59.

E35.5.10 Preformed Neoprene Joint Seals

(a) Further to E35.5.3(d), the preformed neoprene expansion joint seals shall be manufactured from a vulcanized elastomeric compound using crystallization resistant polychoroprene (neoprene) as the only polymer.

(b) The preformed neoprene expansion joint seals shall meet the requirements of the latest edition and all subsequent revisions of Ontario Provincial Standard Specification (OPSS) 1210 "Material Specification for Preformed Neoprene Joint Seals", and as amended herein; and of Table E14.1 of this Specification. All tests will be made on specimens prepared from the extruded seals.

E35.5.11 Epoxy Adhesive

(a) Epoxy adhesive for concrete to steel bonding shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur

32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E35.5.12 Epoxy Grout

(a) Where epoxy grout is used, it shall be Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, Duralcrete, Dural 103 Gel, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E35.5.13 Cementitious Grout

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

E35.6 Equipment

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

E35.7 Construction Methods

E35.7.1 Fabrication

(a) No fabrication shall commence until acceptance of the Shop Drawings from the Contract Administrator has been obtained.

(b) Care shall be taken to ensure that all members are straight and flat and free from twists, bends, and distortions due to welding. The units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall and skew, as well as accurate positioning and alignment of supporting brackets. The Contractor shall exercise care in the handling of all units during shipping and loading operations prevent twists, bends, and warping.

(c) Matching expansion joint assemblies shall be assembled and bolted together for shipping.

(d) Expansion joint assemblies shall be shop checked for fit and match marked.

(e) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint, and other foreign material by commercial sand, grit or shop blasting, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.

(f) In no case shall weldments be substituted for extrusion shapes.

(g) The zinc coating shall be adherent, continuous, and reasonably smooth. It shall be free from imperfections such as blisters; gritty or uncoated areas; acid, black spots, or dross particle adhering to the coating; or other imperfections inconsistent with good commercial galvanizing practice. Globules of zinc that will interfere with the intended use of the material will not be permitted.

(h) The colour of the galvanizing shall be consistent and continuous.

E35.7.2 Installation

(a) The Contractor shall install expansion joints as shown on the Drawings and shall be responsible for the correct matching and seating of parts. The expansion joints shall be checked for accurate matching of sliding plates with the bridge deck expansion joints installed at the specified skews and crossfalls. One field splice in the length of the expansion joint is permitted.

(b) The edges of the expansion joint cover plates shall be seal welded to the expansion joint cover plates as shown on the Drawings.

E35.7.3 Galvanizing Touch-up Prior to Placement of Concrete

(a) Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.

(b) Surfaces to receive field-applied galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.

(c) The process is to be repeated as required to achieve a thickness comparable to original galvanizing, as approved by the Contract Administrator.

E35.7.4 Placement of Concrete at Expansion Joints

(a) The expansion joint assemblies shall be set in position, and secured rigidly in place, such that they will remain true to line and elevation during and after concreting, in accordance with approved details as shown on the Shop Drawings.

(b) Care shall be taken during consolidation of the concrete to ensure that there are no voids in the concrete under and around the expansion joint components and associated reinforcing steel.

(c) Before concreting, the expansion joint opening shall be set to give the correct width for the mean concrete temperature of the deck. The gap width shall be obtained from the Temperature Width Adjustment Table provided on the Drawings, as approved on-site by the Contract Administrator immediately prior to the start of concrete placement.

(d) Immediately in front of concrete placement at the expansion joints, all metal contact surfaces between the expansion joint and concrete shall be coated with epoxy adhesive.

(e) After the concrete has set for seventy-two (72) hours, and after the removal of the Manufacturer's temporary clamping channels, epoxy grout shall be used to fill any associated bolt holes

E35.7.5 Field Welding and Touch-Up Galvanizing

(a) Prior to installation of the seals, the flange of the expansion joint edge members shall be vulcanized or seal welded to the corner plates, as shown on the Drawings, to provide watertight joints.

(b) Any areas of damaged galvanizing or metallizing on miscellaneous steel items shall receive field-applied touch-up galvanizing, in accordance with ASTM A780.

(c) Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. 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.

E35.7.6 Installation of Seal

(a) A permanent 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.

(b) Only upon completion of all concrete cleanup operations shall the Contractor open up the seating areas and prepare them for them installation of the seals.

(c) The installation of the expansion joint seal will be completed according to the construction phasing, as detailed on the Drawings.

E35.7.7 Watertight Verification of Joint Seal

(a) Prior to installing the expansion joint and sidewalk 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.

(b) 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.

E35.7.8 Watertight Verification of Expansion Joint and Concrete Blockouts

(a) Prior to installing the expansion joint and sidewalk 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.

(b) 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.

E35.7.9 Installation of Expansion Joint Cover Plates

(a) Perform cutting, drilling, and fitting required for installation of expansion joint cover assemblies. Touch-up galvanizing shall be completed in accordance with E35.7.5, “Field Welding and Touch-Up Galvanizing”.

(b) Install joint cover assemblies in true alignment and proper relationship to the opening of the expansion joint and adjoining finished surfaces measured from the established lines and levels.

(c) Allow for thermal expansion and contraction of metal to avoid buckling.

(d) Set floor covers at elevations flush with adjacent finished floor materials unless otherwise shown.

(e) Locate wall, ceiling, and overhang covers in continuous contact with adjacent surfaces. Securely attach in place using required accessories. Make allowances for change in joint size due for installation.

(f) Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.

E35.8 Fabrication Warranty

(a) Before final acceptance of the expansion joints by the Contract Administrator, the bridge deck expansion joints supplier shall provide the City with a written warranty stating that they will perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of issuance of the Certificate of Acceptance (Certificate of Acceptance is issued after the successful completion by the Contractor of the Project's standard warranty period), provided that the expansion joints have been properly installed, acceptable to the Contract Administrator. The Supplier shall state that they have observed the installation and found it to be in accordance with their recommended procedure. The Supplier shall warranty the replacement of the expansion joints, including removal of the defective

expansion joint assemblies 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 date of issuance of the Certificate of Acceptance.

E35.9 Installation Warranty

(a) The Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication warranty.

(b) Similar to the expansion joint Supplier, and before final acceptance by the Contract Administrator, the Contractor shall warranty, in writing, the performance of the expansion joints and concrete expansion joint blockouts for a period of five (5) years from the date of issuance of the Certificate of Acceptance (Certificate of Acceptance is issued after the successful completion by the Contractor of the Project's standard warranty period). Provide in the warranty 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.

E35.10 Quality Control

E35.10.1 General

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E35.10.2 Access

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

E35.10.3 Expansion Joint Seal Markings

(a) All expansion joint seals shall be identified as to the Manufacturer by means of a continuous permanent mould mark. The mould marks shall be registered with the Contract Administrator and shall be used on all seals produced by the respective Manufacturer. The seal shall also be permanently marked, on the side of the seal, with the date of production and the batch/lot, at intervals of not more than 1.2 m.

(b) The Contractor shall supply to the Contract Administrator a summary of the seals identifying the date of manufacture, the batch/lot, and the proposed installation location.

E35.10.4 Joint Seal Samples and Testing Procedures

(a) The Contractor shall supply seal sample material at no charge to The City for quality control testing purposes. The samples will each be 1.5 m long. Each sample will represent not more than three expansion joint seals of the same size, lot, and make and shall be continuous with same until sampled by the Contract Administrator. As soon as the seals to be used in the joint assemblies have been manufactured, they shall be available to the Contract Administrator for sampling.

(b) Testing procedures will be in accordance with the latest revisions of the methods indicated on Table E35.1, “Physical Requirements”.

(c) All materials failing to meet the Specification requirements will be rejected.

(d) Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

Table E35.1: Physical Requirements

Property	Physical Requirements	Test Procedure*
1. Tensile Strength	Minimum 13.5 MPa	ASTM D412 OPSS 1210.07.03.01.02
2. Elongation at Break	Minimum 250%	ASTM D412 OPSS 1210.07.03.01.02
3. Hardness, Type A Durometer	55: +7 Points -5 Points	ASTM D2240 OPSS 120.07.03.01.03
4. Oven aging Test 70 Hours at 100°C Reduction in Tensile Strength Reduction in Elongation Increase in Hardness	Maximum 20% Maximum 20% Maximum 10 Points	ASTM D573
5. Permanent Set at Break	Maximum 10%	ASTM D412
6. Low Temperature Stiffening Hardness, Type A Durometer	Maximum 15 Points	ASTM D2240 OPSS 1210.07.03.01.03
7. Oil Swell, ASTM Oil No. 3 70 H at 40°C (wipe with toluene to remove surface contamination)	45 max	ASTM D471
8. Ozone Resistance	No Cracks	ASTM D1149
9. **Safe Compressibility Test (Z min.) Bridge Seal - < 63.5 mm > 63.5 mm	Minimum 50% Minimum 55%	OPSS 1210.07.03.01.04
10. **Pressure Generation at 15% Deflection	Minimum 20 kPa	OPSS 1210.07.03.01.04
11. **Recovery 22 h at -28°C 70 h at -10°C 70 h at + 100°C	Minimum 80% No Cracking Minimum 88% Splitting or Minimum 85% Sticking	OPSS 1210.07.03.01.05

* ASTM - American Society for Testing and Materials
OPSS - Ontario Provincial Standard Specification
** This physical requirement not applicable to lock-in type joint seals

E35.11 Measurement and Payment

E35.11.1 Expansion Joints

(a) Supplying and installing expansion joints shall be measured on a unit basis paid for at the Contract Unit Price per unit for “Supply and Install Expansion Joints”, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

E36. SUPPLY, FABRICATION AND ERECTION OF MISCELLANEOUS METAL

E36.1 Description

E36.1.1 General

(a) This Specification covers all operations relating to the following:

(i) Supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification. Miscellaneous metal includes:

Galvanized Steel:

- Deck drains;
- Edge angles;
- Top rail;
- Rail post;
- Bench support post assembly;
- Sign support post assembly;
- Anchor rods; and
- Associated bolts, anchors, nuts and washers and rubber grummets.

Weathering Steel:

- Screening plates
- Associated bolts, anchors, nuts and washers and rubber grummets.

(ii) Quality control of materials and fabrication.

(iii) Galvanizing of all miscellaneous metal, except for screening plates.

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

E36.2 References

E36.2.1 References and Related Specifications

(a) All related Specifications shall be current issued or latest revision at the first date of tender advertisement.

(b) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel

(c) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding

(d) CSA W59, Welded Steel Construction (Metal Arc Welding)

(e) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles

(f) CSA W47.1, Certification of Companies for Fusion Welding of Steel

(g) ASTM A36, Standard Specification for Carbon Structural Steel

(h) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless

(i) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

(j) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

(k) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes

(l) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service

(m) ASTM F3125, High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength

(n) ASTM A404, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings

(o) ASTM A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

(p) ASTM A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

(q) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

(r) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding

(s) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service

(t) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered

(u) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement

(v) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables

(w) ASTM B29, Standard Specification for Refined Lead

(x) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use

(y) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)

(z) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code

(aa) AWS D1.1, Structural Welding Code – Steel

E36.3 Submittals

E36.3.1 The Contractor shall submit the following to the Contract Administrator:

(a) copies of Mill Test Certificates showing chemical analysis and physical tests of all miscellaneous metal prior to commencement of fabrication. Miscellaneous metal without this certification will be rejected;

(b) certification of chemical analysis and physical tests for all materials;

(c) a complete set of Shop Drawings prior to commencement of fabrication. The Contractor shall indicate on the Shop Drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the Drawings and Specifications. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings. In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings; and,

(d) manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

E36.4 Materials

E36.4.1 General

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

(b) The Contractor shall mark all materials to identify its material specification and grade. This shall be done by suitable marking or by a recognized colour coding.

E36.4.2 Miscellaneous Metals

(a) Structural steel for all components of the miscellaneous metals shall be in accordance with CSA Standard G40.21 M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to

three hundredths of a percent (0 to 0.03%) or fifteen hundredths to twenty-two hundredths of a percent (0.15 to 0.22%) for monotubular shafts and arms, and to less than three tenths of a percent (0.3%) for all other steel components.

E36.4.3 Deck Drains

(a) Steel for deck drains shall be in accordance with latest edition of CAN/CSA G40.21, Grade 300W.

(b) All deck drains shall be hot-dip galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 g/m^2, after fabrication.

E36.4.4 Edge Angles

(a) Steel for edge angles shall be in accordance with latest edition of CAN/CSA G40.21, Grade 300W.

(b) All edge angles plates shall be hot-dip galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 g/m^2, after fabrication.

E36.4.5 Rail Posts and Top Rail

(a) All structural sections for posts and rail shall conform to G40.21, Grade 350W Class C or ASTM A500 Grade C.

(b) All posts and rail shall be hot-dip galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 g/m2.

E36.4.6 Welded Steel Construction

(a) Welded steel construction (Metal Arc Welding) shall conform to the requirements and satisfy the testing procedures of CSA W59.

E36.4.7 Shear Stud Connectors

(a) Shear stud connectors shall conform to the requirements of ASTM A108, Grades 1015, 1018 and 1020.

E36.4.8 Zinc

(a) Zinc for hot dipped, galvanized coatings shall conform to the requirements of ASTM A123.

E36.4.9 Screening Plates

(a) Screening plates steel shall be new and shall be in accordance with CAN/CSA G40.20/G40.21, Grade 350A.

E36.4.10 Bench and Sign Support Post Assembly

(a) Steel for bench and sign support post assembly shall be in accordance with the latest edition of CAN/CSA G40.21, Grade 300W.

(b) All bench and sign support post assembly shall be hot-dipped galvanized in accordance with ASTM A123 and CGA G164 to a minimum net retention of 610 j/m^2, after fabrication.

E36.4.11 Hardware

(a) Bolts, nuts, anchors, washers, all hot-dip galvanized, and rubber grummets.

E36.5 Construction Methods

E36.5.1 Fabrication

(a) General

(i) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(ii) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(iii) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.

(iv) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(v) Field high-tensile bolted connections shall have all holes drilled or sub-punched and reamed using steel templates. Templates shall be located with utmost care as to position and angle and firmly bolted in place.

(vi) Cutting shall be in accordance with AWS D1.1 and CSA W59.

(b) Clean Material

(i) The material shall be clean, free from rust, mill scale, and other foreign matter before being worked in the shop. Material shall be cleaned by wheelabrating, sandblasting or other methods subject to the Contract Administrator's approval.

(c) Finish

(i) All portions of the Work shall be neatly finished. Shearing, cutting, chipping and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

(d) Machining

(i) General

- Machining shall be carried out as indicated on the Drawings and in these Specifications in accordance with established machine shop practice. All machined surfaces shall be free of flaws, cracks and machining ridges and shall present a polished appearance.

(ii) Facing of Bearing Surfaces

- The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with concrete shall meet the ANSI surface roughness requirements as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I:

Steel Slabs	ANSI 2,000
Heavy plates in contact in shoes to be welded Milled ends of compression members	ANSI 1,000
Milled or ground ends of stiffeners and fillers	ANSI 500

(iii) Care shall be taken that the completed surfaces are protected from damage from the time of machining until the installation in a structure.

(iv) Grinding

- Final grinding and machining of the surface of all tension members shall be done parallel to the tensile forces that will occur in the assembled member.

(v) Butting Joints

- Butting joints in compression members shall be faced and brought to an even bearing by milling or other methods meeting the Contract Administrator's approval.

(vi) Bored Holes

- Bored holes shall be true to specified diameter, smooth and straight, at right angles with the axis of the member and parallel with each other, unless otherwise required. The final surface shall be produced by a finished cut. Boring of holes in built-up members shall be done after assembly is complete.

(vii) Flat Machined Surfaces

- Where called for on the Drawings, flat machined surfaces shall be obtained by planing or machine grinding, or other methods meeting the

Contract Administrator's approval. The direction of machining and the extent of the areas to be machined shall be as indicated on the Drawings or as directed by the Contract Administrator. Flat machined surfaces shall be straight, true and smooth.

(viii) Curved Machined Surfaces

- Curved surfaces shall be machined carefully in accordance with Drawings and Specifications in order to ensure correct fit of mating parts.

(e) Bending

(i) When bending is necessary in order to meet the requirements of the design, it shall be done with care and by methods subject to the approval of the Contract Administrator. The bend line shall be at right angles to the direction of rolling. The internal radius of bend of load carrying sections shall not be less than twice the thickness of the bend section when bent cold, and if a smaller radius of bend is essential, the material shall be bent hot and later annealed. Before bending, the edges of the section in the region of the bend shall be smoothed and rounded to a radius of 2 mm.

(f) Stress Relieving

(i) Stress relieving of the structure or any component parts attached to the structure shall be done only if called for on the Drawings or in the Special Provisions. If stress relieving is called for, it shall conform to the requirements of AWS D1.1 and CSA W59.

(g) Holes

(i) General

- Except where a specific method of holing materials is shown on the Drawings or required in the Special Provisions, all holes shall be either drilled or sub-punched and reamed with the exception of the holes and slots in the rectangular steel guardrail which may be punched. Poor matching holes will be cause for rejection.

(ii) Punched Holes and Slots

- For holes and slots punched full size, the diameter or size of the die shall not exceed that of the punch by more than 2 mm. All holes and slots which are punched shall have burrs and sharp edges removed. All holes shall be clean-cut without torn of ragged edges. The punching shall not distort the structural member. If required by the Contract Administrator, a sample of the punching operation shall be carried out to the satisfaction of the Contract Administrator prior to the start of fabrication.

(iii) Drilled Holes

- Drilling shall be done with twist drills or core drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.

(iv) Sub-Punched and Reamed Holes

- All holes shall be sub-punched or sub-drilled to a diameter 5 mm smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.

(v) Allowable Tolerance for Holes

- All matching holes for bolts shall register with each other so that a gauge 2 mm less in diameter than the hole shall pass freely through

the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The centre-to-centre distance between any two holes of a group of holes shall not vary by more than 1 mm from the dimensioned distance between such holes. Mispunched or misdrilled members shall not be corrected by welding.

(h) Welding

(i) Specifications

- Welding shall conform to the requirements of the Structural Welding Code - Steel of the American Welding Society AWS D1.1 and addendum and CSA W59 Welded Steel Construction.

(ii) Welding Operator Qualification

- Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. Qualification shall have been issued within 2 years of commencement of fabrication.
- The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he/she will use and all pertinent data of the tests. Evidence that the welding operators have been executing satisfactory welding in the required processes within the six (6) month period immediately prior to commencement of fabrication shall also be provided to the Contract Administrator. The Contractor shall bear the whole cost and be fully responsible for the qualification of all welding operators.

(iii) Welding Procedures, Specifications and Qualification

- Welding procedures that conform in all respects to the approved procedures of AWS D1.1 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications.
- Welding procedures that do not conform to approved procedures in AWS D1.1 and CSA W59 shall be qualified by tests carried out in accordance with AWS D1.1. The Contract Administrator may accept previous qualifications of the welding procedure.

(iv) Welding Materials

- All electrodes for manual shielded metal arc welding shall conform to the low-hydrogen classification requirements of the latest edition of the American Welding Society's Filler Metal Specification AWS A5.1 or AWS A5.5 and the CAN/CSA W48 Specification and be capable of producing weld metal having an impact strength of at least 27 J (Charpy V-Notch) at -18○C. All bare electrodes and flux used in combination for submerged arc welding, the electrode and gas shielding used in combination for gas metal-arc welding, or the electrode and shielding medium used in combination for flux cored arc welding of steels shall conform to the requirements in the latest edition of the American Welding Society AWS A5.17, A5.18 or A5.20 and CAN/CSA W48 and be capable of producing weld metal having a minimum impact strength of 27 J (Charpy V Notch) at -18○C or shall be capable of producing low alloy weld metal having the mechanical properties listed in Table 4.1.1 of AWS D1.1.
- Low alloy weld properties shall be determined from a multiple pass weld made in accordance with the requirements of the latest edition of the applicable Specification (AWS A5.17, A5.18, or A5.20) or the welding procedure specification.
- Every user shall demonstrate that each combination of electrode and shielding medium will produce weld metal having the above mechanical properties until the applicable AWS Filler Metal Specification is issued. At that time, the AWS Filler Metal Specification will control. The test

assembly for Grades E100XX and E110XX shall be made using CAN/CSA G40.21M 700Q or ASTM A514/A517 steel.

- The Contract Administrator may accept evidence of record of a combination that has been satisfactory tested in lieu of the test required, provided the same welding procedure is used.
- Electrodes conforming to AWS A5.1 shall be purchased & delivered in hermetically sealed containers or shall be dried for at least two (2) hours between 230°C and 260°C before they are used. Electrodes conforming to AWS A5.5 shall be purchased & delivered in hermetically sealed containers or shall be dried 1 hour + 15 min. at a temperature of 425°C + 15°C before being used. All electrodes for use in welding ASTM A514/A517 and CSA 700 Q. steel having a strength lower than that of the E100XX classification shall be dried for 1 hour + 15 min. at a temperature of 425°C + 15°C before being used.
- Electrodes shall be dried prior to use if the hermetically sealed container shows evidence of damage. Immediately after removal from hermetically sealed containers or from drying ovens, electrodes shall be stored in ovens held at a temperature of at least 120ºC. E70XX electrodes that are not used within four (4) hours, E80XX within 2 hours, E90XX within one (1) hour, and E100XX and E110XX within 0.5 hours after removal from hermetically sealed containers or removal from a drying or storage oven shall be re-dried before use. In humid atmospheres, these time limits will be reduced as directed by the Contract Administrator. Electrodes that have been wet shall not be used. Electrodes shall be re-dried no more than once.
- Flux used for submerged arc welding shall be non-hygroscopic, dry and free of contamination from dirt, mill-scale, or other foreign material. All flux shall be purchased in moisture-proof packages capable of being stored under normal conditions for at least six (6) months without such storage affecting its welding characteristics or weld properties.
- Flux from packages damaged in transit or handling shall be discarded or shall be dried before use at a minimum temperature of 120°C for 1 hour. Flux shall be placed in the dispensing system immediately upon opening a package. If flux is used from an open package or an open hopper that has been inoperative for four (4) hours or more, the top 25 mm shall be discarded. Flux that has been wet shall not be used. Flux fused in welding shall not be reused.

(v) Preheat and Interpass Temperature

- The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1 and CSA W59.

(vi) Welding Processes

- Welding processes which do not conform to the provisions of AWS D1.1 or CSA W59 shall not be used without the written approval of the Contract Administrator.

BASE METAL	WELDING PROCESS					BASE METAL
	SMAW		GMAW	FCAW	SAW	
CSA G40.21M	CSA W48.1 AWS A.5.1	CSA W48.3 AWS A5.5	CSA W48.4 AWS A5.18.5.28	CSA W48.5 AWS A5.20	CSA W48.6 AWS A5.17.5.23	ASTM
230G 260W,260T	E60XX E70XX		E70S-X E7OU-X	E60T-X E70T-X	F6X-XXX F7X-XXXX	A53 Gr B A500 Gr A A516Gr55.60
300W 300T	E70XX or E60XX	E70XX	E70S-X E70U-X	E70T-X[a] or F60T-X	F7X-XXXX or F6X-XXXX	A36 A441>4” A550GrB A501

BASE METAL	WELDING PROCESS					BASE METAL
						A529 A570Gr D,E A572Gr42,45 A607Gr45
350R[b,c] 350A[b,c] 400A[b,c]	E70XX	E70XX	E70S-X E70U-X	E70T-X[a]	F7X-XXXX	A242[C] A441#4” A516Gr65,70 A570Gr50,55 588[C] A606 A607Gr50,55 A618 A633Gr,A,B,C,D
400G[d],400W 400T		E80XX	GrE80S	GrE80T	GrF80	A572Gr60,65
480W 480T		E90XX	GrE90S	Gr390T	GrF90	
480A[b,d]		E100XX	GrE100S	GrE100T	GrF100	
700Q[d]		E110XX	GrE110S	Gr3110T	GrF110	A514 A517

Footnotes for Matching of Base Metal and Electrode Combinations

a) Exclusive of E70T-2, E70T-3, E70T0-G
b) When steels of Types R and A are used in the exposed, bare, unpainted condition, the electrodes suggested or others producing a similar alloy composition in the deposited metal should be used. For applications where the material is not boldly exposed, where a colour match is not important, for all but capping passes in multipass welds and for narrow single pass welds, the electrodes suggested for Grades 300T, 400T and 480T may be used (See CAN/CSA G40.21M).
c) See Clauses 5.2.1.4 and 5.2.1.5 and Table 5-2 of CSA W59.
d) See Mfg. Specifications.

Use of the same-type filler metal having the next higher mechanical properties as listed in the AWS or CSA Specifications is permitted:

.1 In joints involving base metals of different yield points or strength, filler metal applicable to the lower strength base metal may be used subject to the Contract Administrator's approval.
.2 When welds are to be stress relieved, the deposited weld metal shall not exceed 0.05% vanadium.
.3 See AWS D1.1 article 4.20 for Electroslag and Electrogas weld metal requirements. Appendix C Impact Requirements are mandatory.
.4 Lower strength filler metal may be used for fillet welds and partial penetration groove welds when indicated on the plans or in the special provisions.

(vii) Distortion and Shrinkage Stresses

- Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of 120°C, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.1 and CSA W59 shall be followed in the control of distortion and shrinkage stresses.

(viii) Tack Welding

- All tack welds shall be a minimum of 10 mm in length and made with low hydrogen electrodes and shall not be incorporated in the final structure without specific written authorization by the Contract Administrator.

(ix) (ix) Stud Shear Connectors

- The accessories, equipment and welding procedures for the installation of the shear connectors shall be in accordance with AWS D1.1 and CSA W59. Welding by hand will not be allowed.

(x) Hot-Dip Galvanizing

- Galvanizing, when called for on the Drawings, shall be done in accordance with ASTM A123 and CSA G164;

- All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material to SSPC – SP 6 (sand, grit or shop blasting or pickling) prior to galvanizing.
- Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling to SSPC – SP 1.

E36.5.2 Handling, Delivery and Storage of Materials

(a) Precautionary measures shall be taken to avoid damage to miscellaneous metal during handling, transit, stockpiling and erecting. Pinholes, or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of miscellaneous metal. Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

(b) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the miscellaneous metal. The materials shall be kept separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

E36.5.3 Erection

(a) Layout

(i) Before erection of miscellaneous metal, the Contractor shall satisfy himself that the installation locations are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

E36.5.4 Workmanship

(a) The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.

(b) Hammering which will injure or distort the member is not permitted.

E36.5.5 Misfits and Field Fitting

(a) Misfits of any part or parts to be erected under this Specification may be cause for rejection. No field fitting shall be undertaken by the Contractor until the cause for misfit of parts has been determined and the Contract Administrator, so informed, has given direct approval to accept the Contractor's proposed corrective measures. The Contract Administrator's decision as to the quantity of such work to be performed at the Contactor’s expense will be final and binding.

E36.5.6 Field Welding

(a) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings, AWS D1.1 and CSA W59.

E36.5.7 Final Cleaning

(a) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E36.6 Quality Control

E36.6.1 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Work. All miscellaneous metal shall be free of surface imperfections, pipes, porosity, laps, laminations and other defects.

(a) Welding

(i) All welding may be subject to inspection by Non-Destructive Testing. This inspection shall be carried out in a manner approved of the Contract Administrator.

(ii) The Contractor shall provide sufficient access and shop area to permit the performance of the tests.

(iii) The Contractor shall give the Contract Administrator not less than 24 hours" notice of when work will be ready for testing and shall advise the Contract Administrator of the type and quantity of work that will be ready for testing.

(iv) All defects revealed shall be repaired by the Contractor at their own expense and to the approval of the Contract Administrator.

E36.7 Quality Assurance

E36.7.1 All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

E36.7.2 All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

E36.7.3 The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works.

E36.8 Measurement and Payment

E36.8.1 Supply, Fabrication and Erection of Miscellaneous Metal will be measured on a weight basis and paid for at the Contract Unit Price for the “Items of Work” listed here below, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted and measured by the Contract Administrator.

Items of Work:
Miscellaneous Metal

(i) Galvanized Steel

(ii) Weathering Steel

E37. ALUMINUM BICYCLE RAIL

E37.1 Description

(a) This Specification shall cover all operations relating to the supply and installation of the aluminum bicycle rail as specified herein and as shown on the Drawings.

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

E37.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

(ii) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;

(iii) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

(iv) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;

(v) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;

(vi) CAN/CSA W59.2 – Welded Aluminum Construction; and

(vii) CAN/CSA S157 – Strength Design in Aluminum.

E37.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the aluminum bicycle rail; and

(ii) Supplying and installing miscellaneous steel items and other items associated with the Work.

E37.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail. Fabrication shall take place as shown on the Drawings.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in E37.8, "Quality Control" and mill certificates.

(d) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

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

(ii) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

(iii) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding

E37.5 Materials

E37.5.1 General

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

E37.5.2 Handling and Storage of Materials

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

E37.5.3 Material for the Aluminum Bicycle Rail

(a) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6).

(b) Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.

(c) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

E37.5.4 Bituminous Paint

(a) Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187. Supply of bituminous paint shall be considered incidental to the supply of aluminum bicycle rail.

E37.5.5 Anchorage System

(a) The rail anchorage system is specified and paid for in accordance with E30, "Structural Concrete".

E37.5.6 Aluminum Shims

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

E37.5.7 Aluminum Filler Alloys for Welded Construction

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

E37.6 Equipment

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

E37.7 Construction Methods

E37.7.1 Layout

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

E37.7.2 Fabrication

(a) General

(i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.

(ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.

(iii) The Fabricator shall fabricate the entire aluminum pedestrian handrail in sections, to permit the installation of the rail sections onto the concrete.

(iv) The punching of identification marks on the members will not be allowed.

(v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.

(vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

(vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

(b) Sample Panel

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

(c) Cutting

(i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be

true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

(d) Welding

(i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.

(ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.

(iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:

(iv) Guided Bend Test: All bend tests should be fully guided through an angle of 1800. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.

(v) Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.

(vi) Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed 3% of the area under inspection.

(e) Bolting

(i) Bolt holes in 10 mm or thinner material may be drilled or punched to finished size. In material thicker than 10 mm, the holes shall be drilled to finished size or subpunched smaller than the normal diameter of the fastener and reamed to size.

(ii) The finished diameter of the holes shall be not more than 7 percent greater than the nominal diameter of the fastener, except:

(iii) Slotted holes for expansion purposes shall be provided as required on the Drawings

(iv) Holes for anchor bolts may be up to 50 percent greater than the nominal bolt diameter with a maximum of 13 mm greater than the nominal bolt diameter.

(v) Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.

(vi) In all bolts, the finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are tightened.

E37.7.3 Installation of Aluminum Bicycle Rail

(a) The aluminum bicycle rail shall be brought on-site and accurately installed as shown on the Drawings.

(b) The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.

(c) The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted. The Contractor shall report to the Contract Administrator any corrective measures.

(d) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be separated with a minimum of two (2) coats of bituminous paint. A minimum 3 mm aluminum shim shall be installed under each post.

E37.8 Quality Control

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E37.8.2 Access

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

E37.8.3 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.

E37.9 Measurement and Payment

E37.9.1 Aluminum Bicycle Rail

(a) Supplying and Installing the aluminum pedestrian handrail shall be measured on a length basis and paid for at the Contract Unit Price per metre for “Supply and Install Aluminum Bicycle Rail”, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

E38. PRUNING OF EXISTING TREES

E38.1 Description

E38.1.1 Provide all labour, materials, methods, equipment and accessories for pruning of existing trees within the limit of Work.

E38.2 Quality Assurance

E38.2.1 Pruning shall be provided by a person with a Manitoba Arborists Certificate with demonstrable experience sourcing and Work.

E38.2.2 Contact the City of Winnipeg Forestry Branch at 204-986-2004 to arrange an on site meeting to review trees to be pruned. Meeting to include the Contract Administrator.

E38.3 Pruning Methodology

E38.3.1 Prune as required to remove dead, broken or damaged limbs.

E38.3.2 Prune back to healthy growth while maintaining balanced crown shape.

E38.3.3 Employ clean sharp tools.

E38.3.4 Make cuts smooth and flush with outer edge of branch collar near the main stem or branch.

E38.3.5 Cuts must be smooth and sloping to prevent accumulation of water on cut.

E38.3.6 Do not leave little stumps (“horns”) on trunks or main branches.

E38.3.7 Prune according to accepted horticultural practices as outline in “The Pruning Manual”, Publication No. 1505-1977 by Agriculture Canada.

E38.4 Measurement and Payment

E38.4.1 Pruning of Existing Trees shall be measured on a unit basis and paid for at the Contract Unit Price per tree for “Pruning of Existing Trees”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, as accepted and measured by the Contract Administrator.

E39. UNIT PAVING

E39.1 Description

E39.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and installation of unit pavers in sidewalk widening formed blockout and over the deck and jump slabs as indicated on the Drawings.

E39.2 References

E39.2.1 CW 3330 – Installation if Interlocking Paving Stones

E39.2.2 CW 3335 – Installation of Interlocking Paving Stones on a Lean Concrete Base

E39.3 Materials

E39.3.1 Unit Pavers:

(a) Holland Series concrete pavers available from Barkman Concrete Ltd. Ph. 204-667-3310, or approved equal, in the following sizes and colours:
  (i) 210 x 105 x 60mm, Desert Buff colour.
  (ii) 210 x 210 x 60mm, Desert Buff colour.
  (iii) 210 x 105 x 60mm, Old Town colour.
  (iv) 210 x 210 x 60mm, Old Town colour.
  (v) 210 x 105 x 60mm, Natural colour.

(vi) 210 x 105 x 60mm, Charcoal colour.

(b) Broadway Series concrete paver, available from Barkman Concrete Ltd. Ph. 204-667-3310, or approved equal, 300 x 151 x 100mm depth, charcoal colour.

E39.3.2 Bedding Sand

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

E39.3.3 Joint Sand

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

E39.4 Construction Method

E39.4.1 Concrete Blockout Verification

(a) Contractor to verify the laid dimensions of unit pavers prior to forming blockouts, including specified joint widths. Use physical samples of specified pavers when construction form work for blockouts.

E39.4.2 Preparation of Sand Base

(a) Remove all accumulated debris from accepted belvedere deck or blockout.

(b) Install bedding sand to the depths indicated on the Drawings.

(c) Bedding sand shall be spread and levelled so that unit pavers are initially 5 mm higher than finished grade.

(d) No more bedding sand will be spread than can be covered with pavers in one day.

(e) Do not compact prior to laying stones.

E39.4.3 Installation of Unit Pavers

(a) Unit pavers shall be installed in formed concrete blockouts and over the belvedere deck in accordance with the specification CW3335, set in locations and patterns as shown on the Drawings. Spaces between joints shall be 5mm maximum and shall be uniform and consistent while maintaining true patterns as indicated on the Drawings.

(b) Obtain approval of pattern layout prior to cutting.

(c) Commence installation of pavers against edge to obtain straightest possible course for installation.

(d) Pavers shall be cut with saw only to obtain true even undamaged edges. Chipped pavers are unacceptable. If narrowing of courses on the belvedere deck is required, do not trim width of outside courses, trim width of intermediate course as indicated on the Drawings.

(e) Paver cutting will be performed in location and manner that does not damage or coat adjacent pavers. Dust from sawing operations will be removed at the end of each day.

(f) Crews shall work on installed pavers, not on sand layer.

(g) Spread and fine grade joint sand over paving surface and sweep into joints.

(h) Unit pavers shall be compacted into the bedding sand layer using accepted walk behind vibratory compactor until they are at the proper grade, uniformly level and free of any movement.

(i) Joint sand shall be swept into the joints until full. Remove excess sand from site.

(j) Replace at no extra cost all whole or cut stones marked as unacceptable.

(k) Remove cracked, chipped, broken or otherwise damaged paving materials from Site immediately.

(l) Upon completion, thoroughly remove excess sand and waste materials.

E39.5 Quality Assurance

E39.5.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations, from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection of approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this specification.

E39.6 Measurement and Payment

E39.6.1 Supply and Install Holland Pavers on Bridge Deck Slab and Jump Slabs

(a) Supply and Install Holland Pavers on Bridge Deck Slab and Jump Slabs shall be measured on an area basis and paid for at the Contract Unit Price per square metre for the “Items of Work” listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, as accepted and measured by the Contract Administrator.

E39.6.2 Items of Work

(a) Supply and Install Holland Pavers on Bridge Deck Slab and Jump Slabs
  (i) 210 x 105 x 60 Holland Paver, Desert Buff Colour
  (ii) 210 x 210 x 60 Holland Paver, Desert Buff Colour
  (iii) 210 x 105 x 60 Holland Paver, Old Town Colour
  (iv) 210 x 210 x 60 Holland Paver, Old Town Colour
  (v) 210 x 105 x 60 Holland Paver, Natural Colour
  (vi) 210 x 105 x 60 Holland Paver, Charcoal Colour
  (vii) 210 x 210 x 60 Holland Paver, Charcoal Colour

E39.6.3 Supply and Install Broadway Pavers in Formed Blockout

(a) Supply and Install Broadway Pavers in Formed Blockout shall be measured on an area basis and paid for at the Contract Unit Price per square metre for “Supply and Install “Broadway Pavers in Formed Blockout”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, as accepted and measured by the Contract Administrator.

E40. EXTERIOR SITE CARPENTRY

E40.1 Description

E40.1.1 Provide labour, materials, methods, equipment and accessories for the fabrication and installation of timber bench and guardrail sections.

E40.2 References

E40.2.1 Canadian Standards Association (CSA International)

(a) CSA B111, Wire Nails, Spikes and Staples

(b) CSA O141 Softwood Lumber

E40.3 Materials

E40.3.1 White Oak Timbers

(a) Harvested or reclaimed source common white oak, ‘rustic’ grade, or approved alternate.

E40.3.2 Hardware

(a) Structural screws: GRK RSS structural screws or approved alternate, size as indicated on the Drawings.

(b) Threaded rods, bolts, nuts, washers, lag screws to be hot dipped galvanized, sizes as indicated on the Drawings.

E40.4 Quality Assurance

E40.4.1 Carpentry shall be performed by trained and qualified craftspeople with demonstrable experience sourcing and work.

E40.4.2 Conduct a pre-installation meeting with the Contract Administrator to verify requirements.

E40.4.3 Lumber Identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

E40.4.4 All wood to be free of defects. Any warped, checked or bent materials will be rejected.

E40.5 Construction Method

E40.5.1 Handle and install wood in a manner that will avoid damage to timbers.

E40.5.2 Construct all work as indicated on the Drawings using adequate fastening methods to ensure solid durable finished work suitable for the purpose intended.

E40.5.3 Orient timbers with most presentable faces exposed.

E40.5.4 Do all fastening neatly, evenly and thoroughly.

E40.5.5 Install all members true to line, levels and elevations.

E40.5.6 Where indicated, set plumb and space uniformly. Shim with hot dip galvanized washers if necessary to create consistent height for bench seat boards and consistent depth for bench back members.

E40.5.7 Inform Contract Administrator of any gaps between members greater than 100mm that could create an entrapment hazard.

E40.5.8 Countersink bolts and fasteners as indicated.

E40.5.9 Sand exposed faces of bench seat and back members to provide a smooth, even, splinter free surface.

E40.6 Measurement and Payment

E40.6.1 The supply and installation of Exterior Site Carpentry will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below. Price shall be payment in full for supplying materials and for performing the Work in accordance with this Specification and accepted by the Contract Administrator. Prices exclude metal support plates, which shall be paid for under 0 Supply, Fabrication and Erection of Miscellaneous Metals.

(a) Items of Work:
Exterior Site Carpentry

(i) Supply and Install Feature Bench Timbers
(ii) Supply and Install South Guardrail 1 Timbers
(iii) Supply and Install South Guardrail 2 Timbers
(iv) Supply and Install North Guardrail 1 Timbers
(v) Supply and Install North Guardrail 2 Timbers

E41. PLANTING MEDIUM & FINISHED GRADING

E41.1 Description

E41.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and installation of planting medium for planting beds, tree pits, turf areas and riverbank restoration work.

E41.2 References

E41.2.1 Agriculture and Agri-Food Canada

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

E41.2.2 Canadian Council of Ministers of the Environment (CCME) Guidelines.

E41.2.3 The City of Winnipeg Standard Construction Specifications

.1 CW 1130 – Site Requirements

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

E41.3 Submittals

E41.3.1 Submit 0.5kg sample of planting medium to National Testing Laboratory, or approved alternate, and indicate present use and intended use. Prepare and ship sample in accordance with Provincial regulations and testing laboratory requirements.

E41.3.2 Submit two (2) copies of soil analysis and recommendations for corrections to Contract Administrator.

E41.4 Quality Assurance

E41.4.1 Inform Contract Administrator of proposed source of materials to be supplied and provide a sample for review by Contract Administrator prior to installation.

E41.4.2 Testing of planting medium to be carried out and paid for by Contractor. Prepare and ship planting medium samples to approved laboratory in accordance with Provincial regulations and laboratory requirements, indicating intended use on each sample.

E41.4.3 Test planting medium for nutrients N, P, K, micronutrients, soluble salt content, pH value and OM (organic matter).

E41.4.4 Acceptance of planting medium is subject to an inspection of material and confirmation of test results. Do not commence soft landscaping work until Contract Administrator has accepted planting medium.

E41.5 Delivery, Storage and Handling

E41.5.1 Store materials in a dry area, protected from freezing, sedimentation and contamination.

E41.5.2 Deliver and store fertilizer in waterproof bags labeled with weight, analysis and name of manufacturer.

E41.6 Materials

E41.6.1 Planting Medium: In accordance with CW 3540.

E41.7 Construction Method

E41.7.1 Subsoil Preparation

(a) Prior to placing topsoil in naturalization areas, scarify subsoil across the slope to a depth of 75 mm.

E41.7.2 Planting Medium Placement

(a) Obtain approval of tree pit excavation, subsoil scarification and rough grading of naturalization areas prior to placing planting medium.

(b) Place planting medium in uniform layers over unfrozen sub-grade, to the depths indicated on the Drawings.

(c) Eliminate rough spots and low areas, Prepare a loose, friable bed, boot firm and level.

E41.7.3 Soil Amendments

(a) Apply lime, sulphur, or other soil amendment at a rate determined and recommended from planting medium sample test.

(b) Mix soil amendment well into full depth topsoil prior to application of fertilizer.

E41.7.4 Finished Grading

(a) Per CW3540.

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

E41.7.5 Surplus Material

(a) Dispose of unused planting medium off Site in accordance with CW1130.

E41.7.6 Cleaning

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

E41.8 Measurement and Payment

E41.8.1 Supply and placement of planting medium in tree wells will not be measured. This item of Work shall be considered incidental to the cost of “Supply and Installation of Trees, Shrubs and Ground Covers” performed in accordance with this Specification and accepted by the Contract Administrator.

E41.8.2 Supply and Place Topsoil, 100mm Depth

(a) Supply and Place Topsoil, 100mm Depth shall be measured on a volume basis and paid for at the Contract Unit Price per cubic meter for “Supply and Place Topsoil, 100mm Depth”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, as accepted and measured by the Contract Administrator.

E41.8.3 Supply and Place Planting Medium for Shrub Beds

(a) Supply and Place Planting Medium for Shrub Beds shall be measured on a volume basis and paid for at the Contract Unit Price per cubic meter for “Supply and Place Planting Medium for Shrub Beds”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, as accepted and measured by the Contract Administrator.

E42. TREES, SHRUBS & GROUNDCOVER PLANTINGS

E42.1 Description

E42.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and installation of trees.

E42.2 References

E42.2.1 Agriculture and Agri-Food Canada (AAFC)

(a) Plant Hardiness Zones in Canada-2000.

E42.2.2 Canadian Nursery Landscape Association (CNLA)

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

E42.2.3 Department of Justice Canada (JUS)

(a) Plant Canadian Environmental Protection Act (CEPA), 1999, c. 33.

(b) Transport of Dangerous Goods Act (TDGA), 1992, c.34.

E42.2.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

(a) Materials Safety Data Sheets (MSDS).

E42.3 Submittals

E42.3.1 Submit product data for:

(a) Fertilizer.

E42.4 Source Quality Control

E42.4.1 Obtain approval from Contract Administrator of plant material at source.

E42.4.2 Notify Contract Administrator of source of material at least seven (7) days in advance of shipment. No work under this Section is to proceed without approval.

E42.4.3 Acceptance of plant material at source does not prevent rejection on Site prior to or after planting operations.

E42.4.4 Plant material imported from other nations will not be accepted.

E42.4.5 Bare root plant material will not be accepted.

E42.5 Storage and Protection

E42.5.1 Coordinate the shipping of plants and excavation of holes to ensure minimum time laps between digging and planting.

E42.5.2 Protect plant material from frost, excessive heat, wind and sun during delivery.

E42.5.3 Protect plant material from damage during transportation:

(a) When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.

(b) When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.

(c) Protect foliage and rootballs using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

E42.5.4 Protect stored plant material from frost, wind and sun as follows:

(a) For bare root plant material, preserve moisture around roots by heeling-in or burying roots in topsoil and watering to full depth of root zone.

(b) For pots and containers, maintain moisture level in containers.

(c) For balled and burlapped and wire basket rootballs, place to protect branches from damage. Maintain moisture level in root zones.

E42.5.5 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 20mm (3/4”) diameter with wound dressing.

E42.5.6 Keep roots moist and protect from sun and wind. Heel-in trees that cannot be planted immediately in shaded areas and water well.

E42.6 Scheduling

E42.6.1 Order plant material as soon as possible after award of contract to ensure plant availability. Request substitutes as required.

E42.6.2 Provide Contract Administrator a written schedule fourteen (14) days in advance of shipment of plant material. Schedule to include: quantity and type of plant material, shipping dates, arrival dates on Site, and planting dates.

E42.7 Warranty of Nursery Stock

E42.7.1 For all plant material a one (1) year warranty period is required.

E42.7.2 During the warranty period, upon written notification from the Contract Administrator, the Contractor warrants to replace and replant any nursery stock found dead and/or in poor condition as soon as possible thereafter, without cost to The City. "Poor Condition" shall be interpreted as meaning nursery stock on which branches are dead or dying, or have not shown satisfactory growth in leaves. Exempted is nursery stock damaged by accidental causes or vandalism, which stock shall be replaced at the cost of The City.

E42.7.3 End-of-Warranty inspection will be conducted by Contract Administrator.

E42.7.4 Contact Administrator reserves the right to extend Contractor's warranty responsibilities for an additional one (1) year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

E42.8 Replacements

E42.8.1 During warranty period, remove from Site any plant material that has died or failed to grow satisfactorily as determined by the Contract Administrator.

E42.8.2 Extend warranty on replacement plant material for a period equal to the original warranty period.

E42.8.3 All required replacements shall be by plants of at least the same size and species as specified, and shall be supplied and planted in accordance with the original Drawings and Specifications.

E42.8.4 Should the replaced plant material not survive, the Contractor will be responsible to replace it a third time and guarantee it for a period equal to the original warranty period unless it is determined that unique Site conditions or inadequate maintenance causes the death of plants

E42.9 Plant Material

E42.9.1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

E42.9.2 Source of plant material: grown in Zone 3 only in accordance with Plant Hardiness Zones in Canada.

E42.9.3 Plant material must be planted in zone indicated as appropriate for its species.

E42.9.4 Plant material free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

E42.9.5 Substitutions to plant material as indicated on planting plan are not permitted unless written approval has been obtained as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.

E42.9.6 Refer to Plant Specification List on the Drawings and the Drawings for species, quantities, size and quality of plant materials.

E42.10 Water

E42.10.1 Water free of impurities that would hinder plant growth. The Contractor shall provide water, so that all costs to provide water for the watering operation and all associated costs shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.

E42.10.2 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-law. Sewer charges will not be assessed for water obtained from a hydrant.

E42.11 Planting Medium: backfill with planting medium as specified in 0.

E42.12 Stakes: 76mm dia. x 2440mm ht. wooden stakes.

E42.13 Tree Tie: biodegradable or polyethylene fabric strapping min. 30mm wide.

E42.14 Mulch: Clean wood chip mulch free of leaves, branches and other extraneous matter, consisting of chips not less than 15 mm nor larger than 75 mm in size and not more than 20 mm thick.

E42.15 Fertilizer: synthetic start-up slow release fertilizer with a N-P-K analysis of 12-36-15 ratio at a rate of 4 kg per 100 m2 which is 8 pounds per 100 sq. ft.

E42.16 Pre-Planting Preparation

E42.16.1 Obtain approval from Contract Administrator of finish grading, and planting medium installation prior to commencing Work in this section.

E42.16.2 Ensure plant material is acceptable to the Contract Administrator.

E42.16.3 Remove damaged roots and branches from plant material with sharp clean equipment treating wounds as necessary to maintain plant health.

E42.16.4 Apply anti-desiccant to deciduous trees in leaf in accordance with manufacturer's instructions.

E42.17 Plant Material Layout

E42.17.1 For individual trees:

(a) Stake out locations of all trees and obtain approval from Consultant prior to excavating tree pits.

(b) Excavate tree pits to depths and widths indicated on the Drawings.

(c) Remove rocks, roots, debris and toxic material from the tree pit.

(d) Scarify sides of planting hole.

(e) Protect excavations from freezing. Remove any water prior to planting.

(f) If the planting location contains a stump with a diameter less than 15 cm it shall be removed.

(g) Tree pits shall be excavated to a width and length to provide minimum 15cu.m of a combination of planting median and suitable insitu soil (amended as required based on insitu soil test results).

E42.17.2 For shrubs, groundcovers, vines, perennials:

(a) Prepare planting beds. Refer to Planting Medium Specification.

(b) Lay out plants per drawings carefully ensuring spacing specified on the Drawings.

(c) Obtain Contract Administrator approval of plant layouts and make any necessary adjustments on Site.

E42.17.3 Remove water which enters excavations or planting beds prior to planting. Notify Contract Administrator if water source is groundwater.

E42.18 Planting

E42.18.1 For jute burlap rootballs, cut away top one third of wrapping and wire basket without damaging rootball. Do not pull burlap or rope from under rootball.

E42.18.2 For container stock or rootballs in non-degradable wrapping, remove entire container or wrapping without damaging rootball. Loosen rootball to encourage bonding with planting medium and subgrade.

E42.18.3 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.

E42.18.4 For trees and shrubs:

(a) Backfill planting medium in 150 mm (6”) lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.

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

E42.18.5 For groundcovers, vines and perennials: backfill soil evenly to finish grade and tamp to eliminate air pockets.

E42.18.6 Water plant material thoroughly.

E42.18.7 After soil settlement has occurred, fill with soil to finish grade.

E42.18.8 Dispose of burlap, wire and container material off Site.

E42.19 Tree Supports

E42.19.1 Install tree supports as indicated on the Drawings taking care not to damage or puncture underground utilities.

E42.19.2 Use double stake tree support for deciduous trees:

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

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

(c) Install tree tie 1500mm above grade.

E42.20 Pruning

E42.20.1 Undertake corrective pruning after planting to eliminate torn and broken branches. Do not damage lead branches or remove smaller twigs along main branches. Do not prune to compensate for root loss.

E42.20.2 Pruning shall be performed by a certified arborist or tree professional.

E42.21 Maintenance

E42.22 Maintain plant material from date of planting to the end of the warranty period. Refer to Landscape Maintenance Specification.

E42.23 Measurement and Payment

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

(a) Items of Work:
Supply and Installation of Trees, Shrubs and Ground Covers

(i) Manitoba Maple

(ii) American Elm

(iii) Basswood
(iv) Cottonwood (male)
(v) Peachleaf Willow
(vi) Pygmy Carrigana
(vii) Dwarf American Cranberry
(viii) Purple Pavement Rose
(ix) Karl Foerester Reed Grass
(x) Virginia Creeper

(b) Supply and Place Wood Chip Mulch shall be measured on an area basis and paid for at the Contract Unit Price per square meter for "Supply and Place Wood Chip Mulch", which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, as accepted and measured by the Contract Administrator.

E43. LANDSCAPE MAINTENANCE

E43.1 Description

E43.1.1 Provide all labour, materials, methods, equipment and accessories for the maintenance of trees following acceptance of the plant material to start warranty.

E43.1.2 In general, the Work shall include:

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

E43.1.3 Maintenance shall be performed on an as required basis.

E43.1.4 Mowing will be performed by City staff, following acceptance as outlined in City of Winnipeg Standard Specification CW 3510.

E43.2 Maintenance and Warranty Period

E43.2.1 Maintenance shall occur between the date of installation and up to a period of one (1) year from date landscaped areas are accepted to start warranty. The warranty period for plant materials will be coincidental to the maintenance period.

E43.2.2 Thirty days after the planting installation has been completed, the Contract Administrator shall perform an inspection of the plant material to determine if the plant material is acceptable to start warranty.

E43.3 Materials and Equipment

E43.3.1 Materials shall conform to the requirements of related Specification sections.

E43.3.2 Provide all equipment to properly execute Work. Maintain such equipment in a workable, safe condition while in use during this project.

E43.3.3 Contract Administrator shall review equipment to be used to execute Work prior to execution.

E43.4 Method

E43.4.1 General

(a) Provide watering service within 24 hours, weeding services within 48 hours of the request by the Contract Administrator. Monitor the Site and advise the Contract Administrator of conditions that might void the Contractor's warranty responsibilities.

(b) The Contractor shall maintain a log noting times, dates, equipment used, and quantity of materials used and areas treated for each maintenance application. Forms shall be provided by Contract Administrator. Submit log to Contract Administrator upon request. Contractor shall notify Contract Administrator of the exact time Contractor proposes to commence each application.

(c) Schedule operations in accordance with growth, health, weather conditions, and use of Site.

(d) Perform each operation continuously and completely within a reasonable time period.

(e) Store equipment and materials off Site.

(f) Collect and dispose of debris or excess material on the day the maintenance is undertaken.

E43.4.2 Maintenance of Trees:

(a) Fertilizing: Apply fertilizer only at frequency, ratio and rates as recommended by manufacturer. Water immediately after fertilizing. Apply fertilizer no later than May 30th of each maintenance year.

(b) Watering: Apply water as required to supplement rainfall and to maintain optimum growing conditions. In general, water once a week to achieve rates as indicated. Allow soil to adequately dry between watering to prevent over saturation without creating water stress. Subject to the above-noted requirements, the Contractor must water at least once a week between May 1st and October 15th inclusive. A complete record is to be kept of each series of waterings for all planted trees noting location and date of watering. This record is to be given to the Contract Administrator when requested. Apply 40 litres of water per 25 mm calliper per application using a deep root feeder or low pressure open flow nozzle and hose. The water stream must not gouge the soil and mulch.

(c) Weed Control: Inspect and undertake weed control weekly during the first year of maintenance and monthly during the second year. By hand, remove all weeds with their roots from tree pits and tree beds and dispose of off Site. When weeding operation is complete, replace and rake displaced mulch to its original condition.

(d) Pests and Diseases: Obtain written approval of Contract Administrator prior to using any pesticide. Control pests and disease through pruning or application of pesticides. Use species specific pesticides where possible. Use only pesticides of low mammalian toxicity. Strictly follow manufacturer's written instructions.

(e) Pruning: The Contractor shall provide a person with a Manitoba Arborist's Certificate for each work crew or Work Site. Prune as required to remove dead, broken or damaged limbs. Prune back to healthy growth while maintaining balanced crown shape. Employ clean sharp tools. Make cuts smooth and flush with outer edge of branch collar near the main stem or branch. Cuts must be smooth and sloping to prevent accumulation of water on cut. Do not leave little stumps ("horns") on trunks or main branches. Prune according to accepted horticultural practices as outline in "The Pruning Manual", Publication No. 1505-1977 by Agriculture Canada.

(f) Winter Preparation: Ensure adequate moisture in tree root zones prior to freeze-up.

E43.5 Measurement and Payment

E43.5.1 Landscape maintenance will not be measured and shall be paid for at the Contract Lump Sum Price for "Landscape Maintenance Year 1", which price shall be payment in full for

performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E44. LIMESTONE QUARRY BLOCKS

E44.1 Description

E44.1.1 Provide labour, materials, methods, equipment and accessories for the supply and installation of limestone quarry block retaining wall.

E44.2 References

E44.2.1 American Society for Testing and Materials International, (ASTM)

(a) ASTM C568-03 – Standard Specification for Limestone Dimension Stone.

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

(c) CW 3130 – Supply and Installation of Geotextile Fabrics

E44.3 Submittals

E44.3.1 Deliver one (1) 600 x 600 x 1500mm quarry block to site for approval. Sample quarry block shall be typical of grade, colour and finish specified. Approved sample shall be reference standard for retaining wall, and may be incorporated into the Work.

E44.4 Source Quality Control

E44.4.1 Obtain approval of selected limestone sedimentary planes as source. When proposed source has been approved, use no other source without written authorization.

E44.5 Materials

E44.5.1 Limestone Quarry Blocks: To ASTM C568-03, category II, high density sound hard stone, free of clay pockets. Colour: grey-white to yellow white. Finish: sawn, split and rustic faces as indicated on Drawings. Acceptable supplier: Mariash Quarry. Box 425 279 Vincent Road, Stony Mountain, Manitoba R0C 3A0, phone: 204.344.5115, or approved alternate. Stone sizes as indicated on Drawings.

E44.5.2 Granular Base: to CW 3110 - R19.

E44.6 Construction Method

E44.6.1 Subgrade

(a) Ensure subgrade preparation conforms to compaction requirements and levels required for installation of granular. Grading of subgrade for limestone blocks shall be considered incidental to the work.

E44.6.2 Granular Base

(a) Place granular base to compacted thickness as indicated. Spread and compact granular base material in uniform layers not exceeding 150mm compacted thickness. Compact each layer to 100% Standard Proctor Density. Supplying and placing granular base for limestone blocks shall be considered incidental to the work.

E44.6.3 Layout

(a) Mark proposed block layout for straight and curved runs and obtain approval from Contract Administrator.

E44.6.4 Installation of Quarry Blocks

(a) Set limestone blocks on prepared granular base. Orient blocks to provide consistent appearance of exposed faces. Ensure blocks are level and plumb and with top at required elevation. Add and compact base if necessary. Butt sawn ends of blocks tightly together. Ease any sharp corners.

(b) Install blocks with radius end cuts in curved runs, as indicated on the Drawings.

E44.6.5 Measurement and Payment

E44.6.6 The supply and installation of limestone quarry blocks shall be measured on a weight basis and paid for at the Contract Unit Price per tonne for “Supply and Installation of Limestone Quarry Blocks.” The weight to be paid for will be the total number of tonnes supplied and installed in accordance with this Specification accepted and measured by the Contract Administrator.

E44.6.7 Granular base will be paid for separately under “Supply and Install Base Course”. Price shall be payment in full for supplying materials and for performing the Work indicated herein.

E45. DECORATIVE SANDBLASTING

E45.1 Description

E45.1.1 This Specification shall cover the sandblasted text inscription on unit paver band as shown on the Drawings.

E45.2 Materials

E45.2.1 Stencil: Self-adhesive vinyl plastic or latex rubber core stencil material manufactured specifically for sandblasting industry or approved alternate.

E45.2.2 Alcohol: Isopropyl alcohol.

E45.2.3 Blasting Aggregate: #90 grit size, approved aggregate.

E45.2.4 Supplementary Adhesive: Water soluble, approved adhesive, compatible with stencil material, conforming with the safety and environmental protection requirements of the National Building Code (NBC) 1995; Manitoba Occupational Health and Safety Act; and the Workers Compensation Act.

E45.3 Samples

E45.3.1 General

(a) The Contractor shall furnish a 1m x 1m sample panel for approval by the Contract Administrator prior to construction of the designated areas. The panel shall include a a portion of the text inscription to allow the Contract Administrator to assess depth, clarity, and consistency. If the sample is rejected, additional sample panels shall be made until approval is obtained. The approved sample panel will be kept at the jobsite, and will become the quality standard for on-site blasting.

E45.4 Construction Methods

E45.4.1 Regulations

(a) The Contractor shall comply with all Municipal, Provincial, and Federal Government regulations relating to on-Sites and blasting.

E45.4.2 Safety Precautions

(a) The Contractor shall provide guards, barricades, dust screens, and/or other construction necessary to secure the safety of workers, the public, and personnel alike and shall comply with all Provincial Statues applicable to the work of their nature. Protective clothing and equipment shall be worn at all times during sandblasting operations. The Contractor shall provide all other protective measures as may be required by any law in force in Manitoba.

E45.4.3 Site Conditions

(a) Application of sandblasted patterns only to be done under conditions conducive to a clean and accurate work.

E45.4.4 Protection of Existing Structures

(a) Protect existing structures. In event of damage to such items, immediately replace or make repairs to approval of the Contract Administrator and at no cost to the City.

E45.4.5 Sandblasting Inscription

(a) Prepare stencils from digital pattern files provided by Contract Administrator. Obtain approval of stencil prior to application, and arrange for Contract Administrator designate to be on site when the stencil location and alignment is being confirmed.

E45.4.6 Surface Preparation

(a) Follow manufacturer's written directions for surface preparation of concrete unit pavers. If no directions are provided, sweep entire paver surface clean of any sand, dirt or other debris. Immediately before adhering the stencil, wipe the area to receive the stencil generously with alcohol and allow to evaporate. Use approved safety equipment such as respirators.

E45.4.7 Application of Stencil

(a) Apply in accordance with manufacturer's written instructions, using approved supplementary adhesive in cases of heavy humidity or cool temperatures. Use care to accurately place stencil, since repositioning will weaken the bond. Roll or tamp the stencil in place as directed by the manufacturer. Avoid damaging or dislodging stencil edges when weeding out pattern. Apply heat or pressure as directed by the manufacturer to re-adhere any portions of the stencil not firmly fixed to the pavement.

E45.4.8 Sandblasting

(a) Mask or otherwise protect area around stencil from overspray. Ensure necessary safety precautions and dust control measures are in place prior to commencing any sandblasting. Blast with nozzle perpendicular to stencil - do not blast at an angle. Adjust blast pressure and nozzle distance to suit pattern and detail. Blast depth shall not exceed 3 mm. The use of a recovery head and vacuum equipment to intercept dust as it is created is strongly recommended.

E45.4.9 Restoration and Site Cleanup

(a) Restore sandblasted areas and any adjacent areas affected by the Work to match condition of adjacent undisturbed areas.

(b) Upon completion of Work, fully remove all residual adhesive, blasting aggregate, and other debris, to leave Work Site clean.

E45.5 Quality Control

E45.5.1 Only qualified sandblasting operators will be accepted.

E45.5.2 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.

E45.6 Measurement and Payment

E45.6.1 Sandblasted Inscription

(a) No measurement will be made for this Work. Decorative sandblasting shall be paid for at the Contract Lump Sum Price for "Decorative Sandblasting", which price shall be payment in full for supplying all material and performing all operations herein described and all other items incidental to the Work included in this Specification.

E46. SITE FURNISHINGS

E46.1 Description

E46.1.1 Provide all labour, materials, methods, equipment and accessories for the supply and install of benches, waste receptacles, and bike racks.

E46.2 Submittals

E46.2.1 Submit product data and shop drawings for benches, waste receptacles and bike racks, indicating sizes, assembly, method of anchorage, finish and installation details.

E46.3 Materials

E46.3.1 Victor Stanley Bench

(a) Victor Stanley Inc. Classic Series C-140 with centre arm rest, black powdercoated, IPE hardwood slats. Supplied by Victor Stanley inc., ph. 1-800-368-2573, or approved equal.

(b) Anchor Bolts for Benches on Concrete Sidewalk: 6mm dia. x 100mm stainless steel anchor bolts.

(c) Anchor Bolts for Benches on Unit Pavers in Concrete Blockout: 6mm dia. x 200mm stainless steel anchor bolts.

E46.3.2 Waste Receptacle

(a) Dual stream waste receptacle, surface mounted. Waste receptacle available from Recycle Everywhere ph. 204-942-2284, or approved equal.

(b) Anchor Bolts for Waste Receptacles on Concrete Sidewalk: 6mm dia. x 100mm stainless steel anchor bolts.

(c) Anchor Bolts for Waste Receptacles on Unit Pavers in Concrete Blockout: 6mm dia. x 200mm stainless steel anchor bolts.

E46.3.3 Bike Rack

(a) Hoop style surface mounted bike racks, powdercoated black, to match hoop style bike racks in the Exchange District. Bick racks available from Rackworks ph. 204-955-5221, or approved equal.

(b) Anchor Bolts for Bike Racks on Concrete Sidewalk: 6mm dia. x 100mm stainless steel anchor bolts.

(c) Anchor Bolts for Bike Racks on Unit Pavers in Concrete Blockout: 6mm dia. x 200mm stainless steel anchor bolts.

E46.4 Construction Methods

E46.4.1 All work is to be located and installed in accordance with the Drawings and manufacturer's written instructions.

E46.4.2 All furnishings to be installed plumb and true to correct elevations and location, as directed by the Contract Administrator. The Contractor shall confirm proposed locations of all site furnishings with Contract Administrator prior to installation.

E46.4.3 All furnishings to be carefully handled so that no parts will be bent, broken, or otherwise damaged. Contractor is responsible for replacing any damaged furnishings, prior to installation, at no cost to the City.

E46.4.4 Prior to installing benches, waste receptacles or bicycle racks on pavers, remove pavers at mounting locations and verify with Contract Administrator that concrete base below pavers is in suitable condition to accept anchors.

E46.5 Measurement and Payment

E46.5.1 The supply and installation of Site Furnishings will be paid for on a unit basis each for the Items of Work listed below. Price shall be payment in full for supplying materials and for performing the Work in accordance with this Specification and accepted by the Contract Administrator. Prices include all mounting hardware.

(a) Items of Work:
Site Furnishings

(i) Supply and Install Victor Stanley Benches

(ii) Supply and Install Waste Receptacles

(iii) Supply and Install Bike Racks

E47. CURBS DOWELLED FOR ASPHALT PAVEMENT

E47.1 Description

E47.1.1 General

(a) This Specification shall cover the construction of concrete barrier curbs with asphalt pavement.

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

(c) This Specification amends and supplements CW 3310.

E47.2 Materials

E47.2.1 All materials shall be as specified in CW 3310.

E47.3 Construction Methods

(a) Barrier curbs shall be constructed as shown on the Drawings. Barrier curbs shall dowelled into and placed on the prepared base course. Asphalt pavement shall be placed after the curbs have been constructed.

(b) All other construction methods shall be as specified in CW 3310.

E47.4 Measurement and Payment

(a) Measurement and payment will be as specified in CW 3310 for each size of curb constructed.

E48. INTERLOCKING PAVING STONES

E48.1 Description

E48.1.1 General

(a) This Specification shall cover the removal, disposal, regrading and installation of interlocking paving stones.

E48.1.2 Referenced Standard Construction Specifications

(a) CW 3330 – Installation of Interlocking Paving Stones

E48.2 Materials

E48.2.1 Interlocking Paving Stones

(a) Paving stones shall be Barkman Concrete Holland Stone Pavers. All pavers to be “Charcoal” in colour.

(b) Paving stones shall conform to the requirements of CAN3-A231.2, Precast Concrete Pavers.

(c) Further to CAN3-A231.2.6.1.1, where concrete pavers are shipped for installation before the pavers are twenty-eight (28) days old, the average compressive strength of these pavers at the time of delivery to the work site shall be not less than 40 MPa.

E48.3 Construction Methods

(a) Installation of Paving Stones

(i) Install interlocking paving stones in accordance with CW 3330.

(b) Regrading Existing Interlocking Paving Stones

(i) Contractor shall salvage existing interlocking paving stones where new sidewalk is tying into existing paving stones and store them for re-installation.

(ii) Regrade existing interlocking paving stones in accordance with CW 3330.

E48.4 Measurement of Payment

E48.4.1 Removal and Disposal of Interlocking Paving Stones

(a) Removal and disposal of interlocking paving stones shall be measured on an area basis. The amount to be paid for shall be the total number of square metres of paving stones removed and disposed of in accordance with this Specification and the Drawings and accepted by the Contract Administrator. Removal and disposal of interlocking paving stones shall be paid for at the Contract Unit Price for “Removal and Disposal of Interlocking Paving Stones”, which price shall be payment in full for the supply of all materials and for performing all operations required to complete the work as specified.

E48.4.2 Supply and Installation of Paving Stones

(a) Supply and installation of interlocking paving stones shall be measured on an area basis. The amount to be paid for shall be the total number of square metres of paving stones supplied and installed in accordance with this Specification and the Drawings and accepted by the Contract Administrator. Supply and Installation of interlocking paving stones shall be paid for at the Contract Unit Price for “Interlocking Paving Stones”, which price shall be payment in full for the supply of all materials and for performing all operations required to complete the work as specified.

(b) No measurement or payment will be made for bedding sand. Bedding sand shall be included in the price paid for “Interlocking Paving Stones”.

E48.4.3 Regrading Existing Interlocking Paving Stones

(a) Measurement and payment for regrading existing interlocking paving stones will be made in accordance with CW 3330.

(b) Salvaging and storing the existing paving stones will be included in the price paid for “Regrading Existing Interlocking Paving Stones”.

E49. UPPERBANK PATH TIE-INS

E49.1 Description

E49.1.1 General

(a) This Specification shall cover the removal of handrails and grinding of concrete curbs flush to facilitate tying in the proposed upperbank path to the Tache Dock and the Esplanade Riel.

E49.2 Construction Methods

E49.2.1 Remove Handrail

(a) The Contractor shall carefully remove and dispose of one section of handrail on the Tache Dock as shown on the Drawings.

E49.2.2 Grind Concrete Curbs Flush

(a) Contractor shall grind the existing concrete curbs flush with the path. The finish shall be smooth and to the satisfaction of the Contract Administrator.

E49.3 Measurement of Payment

(a) The work described in this specification will be measured and will be paid at the Contract Lump Sum Price for the "Items of Work" listed here below which price shall be payment in full for the performance of all operations required to complete the work as specified herein and all other items incidental to the work included in this specification.
Items of Work:
(i) "Grind Curb Flush on Esplanade Riel"
(ii) "Grind Curb Flush and Remove One Section of Handrail on Tache Dock"

E50. SUPPLY, FABRICATION AND ERECTION OF STAINLESS STEEL FLEXIBLE MESH HANDRAIL INFILL

E50.1 Description

E50.1.1 General

(a) This Specification covers all operations relating to the following:
(i) Supply, fabrication, and erection of stainless steel flexible mesh handrail infill as shown or described on the Drawings and in this Specification. Stainless steel flexible mesh handrail infill includes:
- Expanded wire mesh;
- Wire cable;
- Cable eye – rod/rope holders;
- Pre made cable assemblies;
- Turnbuckles;
- Mounting hardware including grommets, bushings, bolts, washers, swaging ferrules, studs, receivers, fittings and other components as required for system installation.

(ii) Quality control of materials and fabrication.

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

E50.2 References

E50.2.1 References and Related Specifications

(a) All related Specifications shall be current issued or latest revision at the first date of tender advertisement.

(b) ASTM A380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.

(c) ASTM A492 - Specification for Stainless Steel Rope Wire.

(d) ASTM A554 – Welded Stainless Steel Mechanical Tubing.

(e) ASTM A554 – Specification for Welded Stainless Steel Mechanical Tubing

(f) ASTM A555 - Stainless Steel Wire.

(g) ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Stairs for Buildings

(h) ASTM F1145 - Specification for Turnbuckles, Swaged, Welded, Forged.

(i) MIL-C5688 - Pre-Stretching and Proof-Testing of Wire Rope Assemblies.

(j) MIL-W-83420 - Wire Rope, Flexible for Aircraft Control.

E50.3 Submittals

E50.3.1 The Contractor shall submit the following to the Contract Administrator:

(a) Product Data: Submit Manufacturer's product data sheet for specified products.

(b) Fabricator's Delegated Design Confirmation: Submit design certificate provided by Fabricator's Delegated Design Engineer which confirms the required cable tension, anticipated maximum deflections of cable between points of support, anchor forces in three directions (vertical, lateral, longitudinal) at the worst-case cable anchor points and forces in two directions (vertical and lateral) at the worst-case intermediate post. The factored anchor force at each cable anchor point shall be less than 25 kN per cable wire. This confirmation shall be provided prior to the commencement of fabrication.

(c) Shop Drawings: A complete set of Shop Drawings prior to commencement of fabrication. The Contractor shall indicate on the Shop Drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the Drawings and Specifications. Show layout, sizes, dimensions, details, and installation of railing frame components. Include mesh aperture and rope dimensions, cable and mesh attachment hardware, tensioning devices, mounting methodology. In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings; and,

(d) Copies of Mill Test Certificates showing chemical analysis and physical tests of all stainless steel flexible mesh infill prior to commencement of fabrication. stainless steel flexible mesh infill without this certification will be rejected;

(e) Certification of chemical analysis and physical tests for all materials;

(f) Submit test reports substantiating strength of wire batch for mesh and cable.

(g) Submit manufacturer's standard cleaning and maintenance instructions to avoid detrimental actions to finishes and performance.

E50.4 Materials

E50.4.1 General

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

(b) The Contractor shall mark all materials to identify its material specification and grade. This shall be done by suitable marking or by a recognized colour coding. Marking shall not damage the material.

E50.4.2 Stainless Steel Flexible Mesh Handrail Infill

(a) Stainless steel flexible mesh handrail infill shall be X-TEND Stainless Steel Flexible Mesh Handrail Infill manufactured by Carl Stahl DécorCable Innovations, Inc., or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

Carl Stahl DécorCable Innovations, Inc., 8080 South Madison Street, Burr Ridge, IL USA 60527. Tel: 312-474-1100, Fax: 312-474-1789, E: sales@decorcable.com, Web: www.decorcable.com

(b) Material: ASTM A492 Type 316 stainless steel 7x7 (or 7x19) wire rope joined with 316 stainless steel ferrules

(c) All additional component supplied with stainless steel flexible mesh handrail infill to be Type 316 stainless steel unless otherwise accepted by the Contract Administrator.

(d) Mesh Cable Diameter: 2.0 mm

(e) Mesh Aperture Dimension (horizontal): 69 mm

(f) Mesh Width (length of wire between cross-over points): 40 mm

(g) Mesh Perimeter Finish: closed loops without loose ferrules for “pass through” installation method.

(h) Direction (Grain) of Mesh: Long direction of diamond horizontal

(i) Ferrule Style: Seamless AISI 316L Stainless Steel Ferrule

(j) Perimeter support for mesh: Stainless Steel Wire Rope consisting of pre made cable assemblies incorporating cable and threaded rod ends

(k) Cable for pre made cable assemblies: ASTM A492 Type 316 stainless steel 7x19 wire rope, nominal diameter 10 mm

(l) Basis of design of pre made cable assemblies is as shown on the Drawings.

(m) Expanded wire mesh, pre made cable assemblies, and all hardware visible from the walking surface of the treetop lookout shall be electrochemically blackened by the INOXPECTRAL method utilized by Carlstahl Decorcable or accepted equivalent. Stainless steel hardware visible on the opposite face of railing posts to the walking surface shall not be blackened.

E50.5 Construction Methods

E50.5.1 Fabrication

(a) General

(i) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(ii) The punching of identification marks on members will not be allowed.

(iii) If damage occurs to the stainless steel flexible mesh handrail during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.

(iv) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(b) Infill Construction

(i) Infill panels shall be dimensioned and manufactured to specified size and labeled according to installer’s specifications.

(c) Finish

(i) All portions of the Work shall be neatly finished. Shearing, cutting, chipping and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

(d) Machining

(i) General

- Machining shall be carried out as indicated on the Drawings and in these Specifications in accordance with established machine shop practice. All machined surfaces shall be free of flaws, cracks and machining ridges and shall present a polished appearance.

(ii) Care shall be taken that the completed surfaces are protected from damage from the time of machining until the installation in a structure.

(iii) Grinding

- Final grinding and machining of the surface of all tension members shall be done parallel to the tensile forces that will occur in the assembled member.

(iv) Bored Holes

- Bored holes shall be true to specified diameter, smooth and straight, at right angles with the axis of the member and parallel with each other, unless otherwise required. The final surface shall be produced by a finished cut. Boring of holes in built-up members shall be done after assembly is complete.

(v) Flat Machined Surfaces

- Where called for on the Drawings, flat machined surfaces shall be obtained by planing or machine grinding, or other methods meeting the Contract Administrator's approval. The direction of machining and the extent of the areas to be machined shall be as indicated on the Drawings or as directed by the Contract Administrator. Flat machined surfaces shall be straight, true and smooth.

(vi) Curved Machined Surfaces

- Curved surfaces shall be machined carefully in accordance with Drawings and Specifications in order to ensure correct fit of mating parts.

(e) Holes

(i) General

- Except where a specific method of holing materials is shown on the Drawings or required in the Special Provisions, all holes shall be drilled. Poor matching holes will be cause for rejection.

(ii) Drilled Holes

- Drilling shall be done with twist drills or core drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.

(iii) Allowable Tolerance for Holes

- All matching holes for bolts shall register with each other so that a gauge 2 mm less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The centre-to-centre distance between any two holes of a group of holes shall not vary by more than 1 mm from the dimensioned distance between such holes. Mispunched or misdrilled members shall not be corrected by welding.

E50.5.2 Handling, Delivery and Storage of Materials

(a) Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

(b) Deliver in manufacturer's original, unopened, undamaged containers, identification labels intact.

(c) Precautionary measures shall be taken to avoid damage to stainless steel flexible mesh handrail infill during handling, transit, stockpiling and erecting. Pinholes, or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of miscellaneous metal. Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

(d) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the stainless steel flexible mesh handrail. The materials shall be kept separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

E50.5.3 Erection

(a) Pre-Installation Meeting

(i) Prior to installation, conduct meeting including the Contract Administrator, Contractor, and Fabricator to verify project requirements, framing and support conditions, mounting surfaces, manufacturer's installation instructions, and warranty requirements.

(b) Layout

(i) Before erection of stainless steel flexible mesh handrail infill, the Contractor shall satisfy himself that the installation locations are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

(c) Install mesh infill system in accordance with manufacturer's instructions and the approved shop drawings.

(d) Provide anchorage devices and fittings to secure to in-place construction. Install mesh panel infill system plumb, level, square, and taut.

(e) Anchor railing system to mounting surfaces as indicated on the drawings.

(f) Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion. Such separation shall be provided by natural rubber materials which do not reduce the load carrying capacity of the connections, or other means accepted by the Contract Administrator.

(g) Use manufacturer’s supplied mounting hardware.

(h) Terminate and tension mesh panels in accordance with manufacturer’s instructions.

(i) Ensure mesh is clean, and without waves, kinks, or sags.

(j) Adjust frame support cable tension and connecting hardware.

E50.5.4 Workmanship

(a) The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.

(b) Hammering which will injure or distort the member is not permitted.

E50.5.5 Misfits and Field Fitting

(a) Misfits of any part or parts to be erected under this Specification may be cause for rejection. No field fitting shall be undertaken by the Contractor until the cause for misfit of parts has been determined and the Contract Administrator, so informed, has given direct approval to accept the Contractor's proposed corrective measures. The Contract Administrator's decision as to the quantity of such work to be performed at the Contactor’s expense will be final and binding.

E50.5.6 Final Cleaning

(a) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

(b) The oxide coating process may leave an oil residue. All oil residue must be removed in accordance with manufacturer’s instructions prior to acceptance.

(c) Clean installed products in accordance with manufacturer's instructions before acceptance. Do not use chlorine-based or abrasive cleaners.

(d) Remove from project site and legally dispose of construction debris associated with this work.

E50.6 Quality Control

E50.6.1 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Work. All materials shall be free of surface imperfections, pipes, porosity, laps, laminations and other defects.

E50.6.2 The Contractor shall allow for a minimum of one site visit by the Fabricator's representative to confirm the installation is according to the manufacturer's procedure, and review a representative sample of fully installed mesh with the Contract Administrator.

E50.6.3 The Contractor shall confirm the as-installed tension in the pre made cable assemblies through use of a suitably calibrated tension meter, and provide documentation of results for the Contract Administrator's records.

E50.7 Quality Assurance

E50.7.1 All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

E50.7.2 All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

E50.7.3 The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works.

E50.8 Measurement and Payment

E50.8.1 Supply, Fabrication and Erection of Stainless Steel Flexible Mesh Handrail Infill will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Stainless Steel Flexible Mesh Handrail Infill", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.