THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 712-2013

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 **PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS**

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, December 20, 2013.

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, a site meeting will be held to provide Bidders access within the CN right-of-way and proposed Contract 3 site on Wednesday December 11, 2013 at 3:30 p.m. Meet at the Transcona Golf Club parking lot at 2120 Dugald Road. No additional site visits on Railway property will be permitted without prior arrangements with the Contract Administrator.

B3.2 The Bidder is required to complete CN's Contractor Orientation Training as outlined in Appendix "B", prior to entering CN property for the site investigation.

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

B4. BIDDERS' CONFERENCE

B4.1 Further to C3.1, the Contract Administrator will hold a non-mandatory Bidders' conference at Canad Inns Destination Centre Transcona, 826 Regent Avenue West, Winnipeg, MB, at 3:00 pm on December 4, 2013.

B4.2 The Bidder is advised that, at the Bidders' Conference:

(a) A presentation will be given at the non-mandatory Bidders' conference related to the major project components;

(i) Road Reconstruction;
(ii) Underpass Structures;
(iii) Retaining Walls;
(iv) Land Drainage Sewers;
(v) Pumping Station;
(vi) Rail Construction;
(vii) Miscellaneous Underground Works;
(viii) Landscaping Works; and
(ix) Active Transportation Pathways.

(b) Notes of presentations made at this meeting will be available at least one (1) week prior to the Submission Deadline on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/bidopp.asp.

(c) No information provided at this meeting or in the meeting notes is intended to change any provision of the Bid Opportunity. Any required changes arising from the meeting will be explicitly changed through addenda. Notify the Contract Administrator if anything at the meeting of in the notes from the meeting appears to warrant an addendum.

B4.3 The Bidder shall not be entitled to rely on any information or interpretation received at the Bidders' Conference unless that information or interpretation is provided by the Contract Administrator in writing.

B5. ENQUIRIES

B5.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B5.2 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.

B5.3 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.

B5.4 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.

B5.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B5 unless that response or interpretation is provided by the Contract Administrator in writing.

B6. CONFIDENTIALITY

B6.1 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.

B6.2 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.

B7. ADDENDA

B7.1 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.

B7.2 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.

B7.2.1 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

B7.2.2 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.

B7.3 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.

B8. SUBSTITUTES

B8.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B8.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B8.3 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.

B8.4 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 in accordance with B8;

(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 in accordance with B8, 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.

B8.5 The Contract Administrator, after assessing the request for approval of a substitute in accordance with B8, 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.

B8.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.

B8.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B8.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B8.8 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.

B8.9 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.

B8.10 Notwithstanding B8.2 to B8.9, and in accordance with B9.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B17.1(a).

B9. BID COMPONENTS

B9.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices; hard copy;

(c) Bid Security;

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

B9.2 Further to B9.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B8.

B9.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.

B9.4 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.

B9.4.1 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.

B9.4.2 A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.

B9.5 Bidders are advised not to include any information/literature except as requested in accordance with B9.1.

B9.6 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).

B9.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B9.8 Bids shall be submitted to:

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

B10. BID

B10.1 The Bidder shall complete Form A: Bid, making all required entries.

B10.2 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.

B10.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B10.2.

B10.3 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.

B10.4 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; and

(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.

B10.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B10.5 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.

B11. PRICES

B11.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B11.1.1 Notwithstanding C12.2.3(c), prices on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.

B11.1.2 For the convenience of Bidders, and pursuant to B9.4.2 and B17.4.1, an electronic spreadsheet Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Materials Management Division website at http://www.winnipeg.ca/matmgt/

B11.2 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.

B11.3 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.

B11.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

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);

(d) have successfully carried out at least three (3) deep excavations to the level that groundwater pressures from the Upper Carbonate Aquifer have to be mitigated with construction means, methods, techniques, and equipment that are consistent with the proposed method of excavation, shoring, and dewatering detailed in the Specifications.

(e) employ key staff who have successfully carried out at least three (3) deep excavations into the Upper Carbonate Aquifer with construction means, methods, techniques, and equipment that are consistent with the proposed method of excavation, shoring, and dewatering detailed in the Specifications.

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) a valid COR certification number 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

(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 that the Shoring, Dewatering and Excavation approach is consistent with the specified technical requirements of the Specifications.

B12.6 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.

(a) Further to B12.5, proof of compliance with the requirements of B12.3(d) and B12.3(e) shall include sufficient background experience of the organization and the specific personnel

involved in completing the required shoring and dewatering works for construction of the Pumping Station. Experience shall be detailed in terms of a description of previous works, its relevance to the excavation, shoring and dewatering techniques being proposed for use on this project and references (current name, phone number, and e-mail address) to confirm the details presented. Key personnel shall be detailed with supporting resume of experience and project specific references for each relevant project. Key personnel shall include Site Superintendent, Dewatering, shoring and excavation specialists and the Engineer assuming responsibility for the Method Statement and Shop Drawing Submission

B12.7 The Bidder may be required to submit, within three (3) Business Days of a request by the Contract Administrator, a letter confirming CN acceptance of Bidder and any proposed subcontractors conducting works within CN Right of Way satisfactory to the Contract Administrator.

CN contact regarding Bidder eligibility is:

Mr. Shane McCartney, P. Eng.

Manager, Engineering Services

Telephone No. (204) 231-7763

B12.8 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.

B14.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B13 will not be read out.

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/

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/

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

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 in16.1.3 (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 B8.

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.

B17.4.2 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

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:

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

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

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

(e) only one Bid is received; or

(f) 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

C1. GENERAL CONDITIONS

C1.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.

C1.1.1 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

C1.2 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

(a) Roadway Construction
  (i) Plessis Road Asphalt Pavement Reconstruction - Dugald Road to Approx. 300m South, including Dugald Road and Plessis Road Intersection pavement modifications/rehabilitation works
  (ii) Plessis Road Concrete Reconstruction - Dugald Road to Pandora Avenue West.
  (iii) Overhead Sign Structure removal and installation

(b) Underpass Structures
  (i) Construction of a new span Through Plate Girder (TPG) railway bridge supported by rock-socketed caisson foundations
  (ii) Steel sheet pile retaining walls

(c) Land Drainage Sewers

(d) Pumping Station

(e) Dry Pond

(f) Rail
  (i) Track construction, shoofly removal
  (ii) Embankment Works

(g) Miscellaneous Underground Works

(h) Landscaping Works
  (i) Plessis Road – from Pandora Avenue West to 300m south of Dugald Road
  (ii) Dugald Road – 200m east and 200m west of Plessis Road
  (iii) Dry pond and Pumping Station sites

(i) Active Transportation Pathways (ATP)
  (i) Plessis Road - Dugald Avenue to Pandora Avenue West

(j) Demolition of three (3) houses on Plessis Road

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

(a) Roadway Construction
  (i) Construction of Temporary Pavements
  (ii) Removal of Overhead Sign Structures including foundations on Dugald Road
  (iii) Excavate/Fill as required
  (iv) Compaction of existing sub-grade
  (v) Supply and installation of catchbasins and connection pipe (D2.1(a)(ii))
  (vi) Supply and installation of subdrains (D2.1(a)(ii))
  (vii) Supply and installation of geotextile
  (viii) Placement of sub-base and base course

(ix) Construct 250mm concrete pavement (plain-dowelled) slip-forming (D2.1(a)(ii))

(x) Construction of new concrete curb and gutter (D2.1a (i))

(xi) Placement of asphalt pavement (D2.1a (i))

(xii) Construction of new concrete curbs and sidewalks

(xiii) Construction of median slabs and 150mm concrete shoulders(reinforced) (D2.1(a)(ii))

(xiv) Construction of overhead sign structure foundation on Dugald Road and supply and installation of overhead sign structure

(xv) Removal of temporary works on Bournais and Rougeau

(xvi) Boulevard grading

(b) Underpass Structures

(i) Installation of rock-socketed caissons

(ii) Installation of steel sheet pile retaining walls

(iii) Excavate/Fill as required

(iv) Construction of concrete abutments and pier cap

(v) Fabrication and installation of bronze spherical bearings

(vi) Fabrication and installation of steel Through Plate Girder (TPG) spans

(vii) Supply and installation of waterproofing membrane

(viii) Supply and installation of drains and connection pipes

(ix) Reconstruction of main tracks on bridge

(x) Installation of fiber optic cable (by others)

(xi) Relocation of rail traffic on bridge (by others)

(xii) Construction of median and shoulder traffic barriers

(xiii) Construction of median slab

(xiv) Placement of sidewalk and active transportation pathway (ATP) slabs, concrete caps and cladding on steel sheet piles

(xv) Supply and installation of chain link fence and aluminum pedestrian handrail

(xvi) Supply and Installation of “Welcome to Transcona” signs

(c) Land Drainage Sewers

(i) Construction of approximately 600 m of land drainage sewers by open cut and trenchless methods ranging in size from 300 mm to 1050 mm in diameter.

(ii) Installation of new manholes, catchbasins, catch pits, ditch inlets, and sewer service pipe.

(iii) Installation of concrete and CSP culverts ranging in size from 400 mm to 1050 mm in diameter.

(iv) Abandonment and removal of existing catchbasins, land drainage sewers, manholes culverts, and sewer service pipes.

(d) Pumping Station

(i) Construction of cast in place concrete Pumping Station wet well/substructure and rock-socketed caisson foundation.

(ii) Construction of masonry and wood superstructure.

(iii) Construction of mechanical heating and ventilation systems.

(iv) Supply and installation of seven submersible land drainage pumps and associated piping.

(v) Construction of electrical, control and instrumentation systems.

(e) Dry Pond

(i) Excavation of dry pond site.

(ii) Removal of abandoned water pumphouse foundation.

(iii) Construction of berm around dry pond using suitable site fill material.

(iv) Off-site disposal of surplus fill material.

(f) Rail

(i) Track Construction, Shoofly Removal

i) Install remaining turnouts.

ii) Construct track on bridge using previously built track panels.

iii) Complete cut-overs and re-establish service on maintracks.

iv) Remove temporary shoofly, WU01 (South “Malting” Industrial Lead) and WM01 (North Yard Lead) track, respectively and salvage material

(ii) Embankment Works

i) Remove shoofly embankment and shape / reclaim material to form access roads and turnout pads.

ii) Stockpile remaining embankment material.

(g) Miscellaneous Underground Works

(i) Construction of approximately 100 m of 200 mm watermain by open cut methods.

(ii) Installation of miscellaneous hydrants, watermain valves and bends.

(iii) Abandonment and removal of existing watermains, hydrants, valves, and bends.

(iv) Construction of approximately 210 m of 150 mm wastewater forcemain by open cut and trenchless methods.

(v) Construction of approximately 170 m of gravity wastewater sewers ranging in size from 250 mm to 450 mm in diameter by open cut and trenchless methods.

(vi) Installation of wastewater sewer manholes and connections.

(vii) Abandonment and removal of existing wastewater sewers and manholes.

(h) Landscaping Works

(i) Site preparation

(ii) Supply and installation of seed on amended soil

(iii) Supply and installation of sod on topsoil

(iv) Supply and installation of trees and shrubs in growing medium

(v) Long-term maintenance of plant material

(vi) Supply and installation of interlocking paving stones

(vii) Supply and installation of site furnishings

(i) Active Transportation Pathways

(i) Excavate/Fill as required

(ii) Compaction of existing sub-grade

(iii) Installation of geotextile

(iv) Placement of sub-base and base course

(v) Placement of asphalt pavement

(vi) Boulevard grading

(j) Demolition of Houses

(i) Protect services to be maintained

(ii) Remove structures

(iii) Demolish foundations and remove debris from site

(iv) Boulevard Grading

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

(a) **"Contract 1"** means the Plessis Road Twinning and Grade Separation at CN Redditt Subdivision: Rail Shoofly Grade Preparation and Miscellaneous Wastewater Sewer, Watermain and Land Drainage Works;

(b) **"Contract 2"** means the Plessis Road Twinning and Grade Separation at CN Redditt Subdivision: Shoofly Track Installation and Permanent Track Construction at Mileage 246.64;

(c) **"Contract 3"** means the Plessis Road Twinning and Grade Separation at CN Redditt Subdivision: Plessis Road Reconstruction, Underpass Structures, Pumping Station, Land Drainage Sewer and Miscellaneous Underground and Landscaping Works;

(d) **"WM-01"** means North Yard Lead Track;

(e) **"WU-01"** means South "Malting" Industrial Lead Track;

(f) **"CN"** means Canadian National Railway Company or designated representative definition;

(g) **"Fabricator"** means a person or entity having a direct contract with the Contractor to construct by combining or assembling diverse, typically standardized parts;

(h) **"Manufacturer"** means a person or entity having a direct contract with the Contractor to manufacture products not worked to a special design for the Work;

(i) **"Project"** means the construction of an underpass and bi-directional rail bridge, and relocation and improvement of certain roadways and intersections, involving certain sections of Plessis Road, Pandora Avenue West and Dugald Road in east Winnipeg, including the Work of Contracts 1 to 3;

(j) "**Protecting Foreman (also referred to as CN Assigned Employee)**" means the CN employee or Contractor employee qualified in the Canadian Rail Operation Rules (CROR) and CN requirements. Protecting Foremen are responsible for protecting employees against Railway traffic. Protecting Foremen are charged solely with the safe movement of trains and are not responsible for the safety of the Contractor, the Contractor's personnel or the Contractor's equipment; and

(k) "**Pumping Station**" means the new Plessis Underpass Land Drainage Pumping Station at (1090 Plessis Road) Plessis Road located immediately west of Plessis Road and south of the CN Redditt Subdivision.

D3.2 Within the text of the Specifications, reference may be made to the following acronyms in relation to codes, standards and organizations:

AABC	Associated Air Balance Council
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGMA	American Gear Manufacturers Association
AHRI	Air-Conditioning, Heating and Refrigeration Institute

AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APHA	American Public Health Association
API	American Petroleum Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASA	Acoustical Society of America
ASCE	American Society of Civil Engineers
ASCII	American Standard Code for Information Interchange
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	ASTM International (formerly American Society for Testing and Materials)
ATP	Active Transportation Pathway
AWMAC	Architectural Woodwork Manufacturers Association of Canada
AWPA	American Wood Protection Association
AWS	American Welding Society
AWWA	American Water Works Association
CAN	National Standard of Canada
CBAC	Clay Brick Association of Canada
CBM	Certified Ballast Manufacturers
CCA	Canadian Construction Association
CCMC	Canadian Construction Materials Centre
CEA	Canadian Electricity Association
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CGA	Canadian Gas Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CISPI	Cast Iron Soil Pipe Institute
CITC	Canadian Institute of Timber Construction
CIU	Canadian Institute of Underwriters
CLA	Canadian Lumberman's Association
CLSAB	Canadian Lumber Standards Accreditation Board
CMAA	Crane Manufacturers Association of America
CMHC	Canada Mortgage and Housing Corporation
CPCA	Canadian Paint and Coatings Association

CPCI	Canadian Precast/Prestressed Concrete Institute
CRCA	Canadian Roofing Contractors' Association
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSDMA	Canadian Steel Door Manufacturers Association
CSPI	Corrugated Steel Pipe Institute
CSSBI	Canadian Sheet Steel Building Institute
CTI	Cooling Technology Institute
CWB	Canadian Welding Bureau
CWC	Canadian Wood Council
CWDMA	Canadian Window & Door Manufacturers Association
DIN	Deutsche Industrie Norm
EEI	Edison Electric Institute
EEMAC	Electrical Equipment Manufacturers Association of Canada
EFC	Electro-Federation Canada
EIA	Electronic Industries Alliance
EJMA	Expansion Joint Manufacturers Association
ETL	Intertek Testing Services (formerly ETL Testing Laboratories)
FCC	Federal Communications Commission (USA)
FM	Factory Mutual Engineering Corporation
FSA	Fluid Sealing Association
GANA	Glass Association of North America
IAO	Insurers' Advisory Organization
IAPMO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code (published by ICC)
IBRM	Institute of Boiler and Radiator Manufacturers
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IGMAC	Insulating Glass Manufacturers Association of Canada
ISA	International Society of Automation
ISO	International Organization for Standardization
LTIC	Laminated Timber Institute of Canada
MCAC	Mechanical Contractors Association of Canada
MFMA	Metal Framing Manufacturers Association
MPTA	Mechanical Power Transmission Association

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers (USA)
NABA	National Air Barrier Association
NACE	NACE International (formerly National Association of Corrosion Engineers)
NAIMA	North American Insulation Manufacturers Association
NBC	National Building Code of Canada
NEBB	National Environmental Balancing Bureau (USA)
NEC	National Electrical Code (USA)
NECA	National Energy Conservation Association
NEMA	National Electrical Manufacturers Association (USA)
NESC	National Electric Safety Code (published by IEEE)
NFPA	National Fire Protection Association (USA)
NLGA	National Lumber Grades Authority
NRC	National Research Council Canada
NSF	National Sanitation Foundation
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety & Health Administration (USA)
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
RMA	Rubber Manufacturers Association
RSIC	Reinforcing Steel Institute of Canada
SAE	Society of Automotive Engineers
SI	International System of Units
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association (USA)
SSPC	The Society for Protective Coatings
TAC	Transportation Association of Canada
TIAC	Thermal Insulation Association of Canada
UL	Underwriters Laboratories Inc.
ULC	Underwriters Laboratories of Canada
WCB	Workers Compensation Board (Manitoba)

D3.3 Where the edition, version or revision date of a referenced regulation, code or standard is not identified, conform to the latest edition or revision of the referenced regulation, code or standard, including amendments and revisions.

D3.3.1 Where a regulation, code or standard stipulates the edition, version or revision date of a subordinate regulation, code or standard, conform to the stipulated edition, version or revision of the subordinate regulation, code or standard to the extent of the primary regulation, code or standard.

D4. CONTRACT ADMINISTRATOR

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

Barry Biswanger, P.Eng.
Senior Structural Engineer, Transportation
99 Commerce Drive, Winnipeg, Manitoba R3P 0Y7

Telephone No. 204 928-7411
Facsimile No. 204 284-2040

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

D4.3 Bid Submissions must be submitted to the address in B9.8.

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.

D5.2 At least two (2) business days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

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 Contractors 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 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 facsimile number 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

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 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 D10.1, D10.2, and Appendix "B" CN Safety Requirements and CN Work Permit Form, the Contractor shall conform and operate in accordance with the CN "Safety Guidelines for Contractor's" for works within CN Right of Way.

D11. INSURANCE

D11.1 The City shall provide and maintain the following owner controlled project insurance coverage to remain in place at all times during the performance of the Work and throughout the warranty period:

(a) Wrap-up liability insurance in an amount of no less than twenty-five million dollars ($25,000,000) inclusive per occurrence and twenty-five millions dollars ($25,000,000) general aggregate, covering bodily injury, personal injury, property damage and products and completed operations consistent with industry standard insurance policy wordings. Wrap up liability insurance to also include evidence of contractual liability and cross liability clauses.

(i) The Contractor shall be responsible for deductibles up to $50,000 maximum of any one loss.

(ii) The City will carry such insurance to cover the owner, province, federal government, Contractors, Subcontractors and all consultants as insured's. Provision of this insurance by the City is not intended in any way to relieve the Contractor from his obligations under the terms of the Contract. Specifically, losses relating to deductibles for insurance, as well as losses in excess of limits of coverage and any risk of loss that is not covered under the terms of the insurance provided by the City remains with the Contractor.

(iii) Wrap-up liability insurance shall be maintained from the date of the commencement of the Work until the date of Total Performance of the work and shall include an additional 24 months completed operation coverage which will take affect after Total Performance.

(b) Builder's risk insurance, including testing and commission, in the amount of 100% of the underpass project cost and land drainage system including the Pumping Station or as specified by the City to be incorporated into the project, up to a maximum loss limit of $35,000,000.

(i) The policy will insure against all risk of direct loss or damage consistent with industry standard insurance policy wordings, and shall apply to all property in the course of construction, installation, testing and commissioning, reconstruction or repair that is owned by the insureds or owned by others for which the Insured is help responsible. The policy will exclude any and all direct loss to the equipment of the owner, Contractors, Subcontractors or consultants.

(ii) The Contractor shall be responsible for deductibles up to $50,000 maximum of any one loss.

(c) Project specific contractors pollution liability (CPL) insurance in the amount of at least five million dollars ($5,000,000) per occurrence and five million dollars ($5,000,000) aggregate insuring against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder performed by the Contractor, its agents, representatives, employees or Subcontractors. Coverage to include:

(i) bodily injury, sickness, disease, mental anguish or shock sustained by any person, including death;

(ii) property damage including physical injury to or destruction of tangible property and the resulting loss of use thereof; loss of use of tangible property that has not been physically injured or destroyed; diminution in value; and Natural Resource Damages;

(iii) clean-up costs (including restoration/replacement costs);

(iv) defense including costs, charges and expenses incurred in the investigation, adjustment or defense of claims for such compensatory damages.

(v) transported cargo and Non-Owned Disposal Sites (blanket basis)

Coverage shall apply to both sudden and gradual pollution conditions, including the further disruption of pre-existing conditions, arising from the services rendered by the Contractor or others on their behalf. Further, coverage shall apply to conditions on, at, under and emanating from the job site including the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gases, waste materials or other irritants, contaminants or pollutants into or upon land, structures thereupon, the atmosphere or any watercourse or body of water, which results in any loss or damages defined above. Coverage shall not contain any "Insured vs. Insured" exclusions preventing the City from bringing a claim against the Contractor, nor any restrictions for property of others in the care, custody or control of the Contractor.

CPL to remain in place during the performance of the Work and for 24 months after completion.

D11.2 The Contractor and Sub-contractors shall provide and maintain the following insurance coverage at all times during the performance of the work and throughout the warranty period:

(a) Commercial general liability insurance, in the minimum amount of ten million dollars ($10,000,000.00) inclusive. The said commercial general liability insurance shall include

coverage for products and completed operations, blanket contractual liability, cross liability, non-owned automobile, and unlicensed motor vehicle liability. The Province of Manitoba, the Federal Government of Canada and their ministers, officers, employees and agents, the City and CN shall be added as additional insured's.

(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 five million dollars ($5,000,000) inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.

(c) Property insurance for equipment and tools used on the project that may be owned, rented, leased or borrowed.

(d) The Contractor or Subcontractor performing the demolition of the existing buildings will be required to indicate on their evidence of insurance that their operations include demolition operations.

D11.3 Deductibles shall be borne by the Contractor or Subcontractor.

D11.4 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11.5 The Contractor shall not cancel, or cause any such policy or policies to lapse without a minimum thirty (30) days prior written notice to the City.

D11.6 The Contractor shall provide the Contract Administrator with evidence of insurance at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than seven (7) Calendar Days from notification of the award of the Contract. The evidence shall be in a form of a certificate of insurance and must be satisfactory to the City Solicitor.

D11.7 All policies shall be in a form satisfactory to the City and shall be kept in full force during the Work and throughout the warranty period.

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. DETAILED PRICES

D13.1 The Contractor shall provide the Contract Administrator with a detailed price breakdown (Form I: Detailed Prices) for the Pumping Station at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13.2 The Contractor shall state a price for each item or sub-item of the Work identified on Form I: Detailed Prices. The detailed prices must be consistent with the price(s) provided in the Contractor's Bid.

D14. SUBCONTRACTOR LIST

D14.1 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.

D15. EQUIPMENT LIST

D15.1 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.

D16. DETAILED WORK SCHEDULE

D16.1 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.

D16.2 The detailed work schedule shall consist of the following:

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

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

all acceptable to the Contract Administrator.

D16.3 Further to (a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

(a) Roadway Construction

(i) Construction of Temporary Pavements;

(ii) Removal of Overhead Sign Structure;

(iii) Excavate/Subgrade compaction ;

(iv) Supply and installation of catchbasins/connection pipe ;

(v) Supply and installation of subdrains ;

(vi) Supply and placement of geotextile, sub-base and base course;

(vii) Construct 250mm concrete pavement (plain-dowelled) slip-forming;

(viii) Construction of new concrete curb and gutter;

(ix) Placement of asphalt pavement;

(x) Construction of new concrete curbs and sidewalks;

(xi) Construction of concrete median slabs and shoulders;

(xii) Construction of new Overhead Sign Structure;

(xiii) Removal of temporary works on Bournais and Rougeau; and

(xiv) Boulevard grading.

(b) Underpass Structures

(i) Installation of rock-socketed caissons;

(ii) Installation of steel sheet pile retaining walls;

i) Under Bridge

ii) North of Bridge

iii) South of Bridge

(iii) Excavate/Fill as required;

(iv) Construction of concrete abutments and pier cap;

(v) Fabrication and installation of bronze spherical bearings;

(vi) Fabrication and installation of steel Through Plate Girder (TPG) spans;

(vii) Supply and installation of waterproofing membrane;

(viii) Supply and installation of drains and connection pipes;

(ix) Reconstruction of main tracks on bridge;

(x) Installation of fiber optic cable (by others);

(xi) Relocation of rail traffic on bridge (by others);

(xii) Construction of median and shoulder traffic barriers and median slab;

(xiii) Placement of sidewalk slabs, concrete caps and cladding on steel sheet piles;

(xiv) Supply and installation of chain link fence and aluminum pedestrian handrail; and

(xv) Supply and installation of “Welcome to Transcona” signs.

(c) Land Drainage Sewers

(i) Construction of land drainage sewers ranging in size from 300 mm to 1050 mm in diameter;

(ii) Installation of new manholes, catchbasins, catch pits, ditch inlets, and sewer service pipe;

(iii) Installation of concrete and CSP culverts ranging in size from 400 mm to 1050 mm in diameter; and

(iv) Abandonment and removal of existing catchbasins, land drainage sewers, manholes culverts, and sewer service pipes.

(d) Pumping Station

(i) Construction of cast in place concrete Pumping Station wet well/substructure and rock-socketed caisson foundation;

(ii) Construction of masonry and wood superstructure;

(iii) Construction of mechanical heating and ventilation systems;

(iv) Supply and installation of seven submersible land drainage pumps and associated piping; and

(v) Construction of electrical, control and instrumentation systems.

(e) Dry Pond

(i) Excavation of dry pond site;

(ii) Removal of abandoned water pumphouse foundation; and

(iii) Construction of berm around dry pond using suitable site fill material.

(f) Rail Construction

(i) Install remaining turnouts;

(ii) Construct track on bridge using previously built track panels;

(iii) Complete cut-overs and re-establish service on maintracks;

(iv) Remove temporary shoofly, WU01 and WM01 track and salvage material;

(v) Remove shoofly embankment and shape / reclaim material to form access roads and turnout pads; and

(vi) Stockpile remaining embankment material.

(g) Miscellaneous Underground Works

(i) Construction of 200 mm watermain;

(ii) Installation of miscellaneous hydrants, watermain valves and bends;

(iii) Abandonment and removal of existing watermains, hydrants, valves, and bends;

(iv) Construction of 150 mm wastewater forcemain;

(v) Construction of gravity wastewater sewers ranging in size from 250 mm to 450 mm in diameter;

(vi) Installation of wastewater sewer manholes and connections; and

(vii) Abandonment and removal of existing wastewater sewers and manholes.

(h) Landscaping Works

(i) Construction of rest area with paving stones;

(ii) Placement of soil amendments, finish grading and seed;

(iii) Placement of topsoil, finish grading and sod;

(iv) Installation of trees and shrubs;

(v) Long term maintenance of plant material; and

(vi) Installation of site furnishings.

(i) Active Transportation Pathways

(i) Excavate/Subgrade compaction;

(ii) Placement of Geotextile, sub-base and base course;

(iii) Placement of asphalt pavement; and

(iv) Boulevard grading.

(j) Demolition of Houses

(i) Removal of 1164 Plessis;

(ii) Removal of 1168 Plessis;

(iii) Removal of 1172 Plessis; and

(iv) Boulevard grading.

D16.4 Further to D16.2(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.

D16.5 In addition to all other schedules the Contractor is required to submit a detailed breakdown in 15 min increments of all work to be performed during any main track blocks. This is to be submitted a minimum of seven (7) days prior to the requested block date. Included with this submission will be a list of all equipment and personnel that will be on-site to support the planned work during the block. The equipment and personnel shall be of a sufficient number to provide redundancy such that any failures do not cause the time limits of the block to be exceeded.

D17. ENVIRONMENTAL PROTECTION PLAN

D17.1 Prior to commencing construction activities or delivery of materials to Site, submit an Environmental Protection Plan for review and approval by Contract Administrator. The Environmental Protection Plan shall present a comprehensive plan to address known or potential environmental issues which may be present during construction. Where applicable, the Environmental Protection Plan shall include sub-contractor activities. The submission of the Environmental Protection Plan to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the success or failure of all environmental management practices and procedures.

D17.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal
  (i) Canadian Environmental Assessment Act (CEAA) C.37;
  (ii) Fisheries Act C.F-14;
  (iii) Transportation of Dangerous Goods Act and Regulations C.34; and
  (iv) Navigable Waters Protection Act.

(b) Provincial
  (i) The Dangerous Goods Handling and Transportation Act D12;
  (ii) The Endangered Species Act E111;
  (iii) The Environment Act C.E125;
  (iv) The Fire Prevention Act F80;
  (v) The Manitoba Heritage Resources Act H39-1;
  (vi) The Manitoba Noxious Weeds Act N110;
  (vii) The Manitoba Nuisance Act N120;
  (viii) The Public Health Act C.P210;
  (ix) The Workplace Safety and Health Act W210;
  (x) Current applicable Associated Regulations (Note: Provincial Regulations updated as of September 1999); and
  (xi) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.
  (xii) The Pesticides and Fertilizer Control Act, C.C.S.M. c.P40

(c) Municipal
  (i) The City of Winnipeg By-law No. 1/2008 and all amendments up to and including 110/2012;
  (ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 154/2012; and
  (iii) Any other applicable Acts, Regulations, and By-laws.

D17.3 The Environmental Protection Plan shall address the following:

(a) Name[s] of person[s] responsible for ensuring adherence to Environmental Protection Plan.

(b) Name[s] and qualifications of person[s] responsible for manifesting hazardous waste to be removed from Site.

(c) Name[s] and qualifications of person[s] responsible for training Site personnel.

(d) Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

(e) Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including

methods for protection of features including vegetation to be preserved within authorized Work areas.

(f) Environmental Emergency Response: including procedures, instructions, and reporting in the event of unforeseen spill of regulated substance.

(g) Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

(h) Hazardous materials and waste management plan outlining storage, transportation and disposal.

(i) Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project Site.

(j) Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

(k) Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete wash or curing water, clean-up water, dewatering of ground water, hydrostatic test water, and water used in flushing of lines.

(l) Monitor and report to ensure implementation of environmental protection measures.

D17.4 Fires

(a) Fires and burning rubbish or waste materials on Site is not permitted.

D17.5 Disposal of Waste

(a) Dispose all waste at licensed facilities or with licensed haulers.

(b) All waste disposal grounds receiving debris and construction waste from this project must be operated under the authority of a valid permit issued pursuant to MR 150 (latest edition) Waste Disposal Grounds Regulation under the Environment Act.

(c) Dispose of all sewage and seepage from the on-site sanitary facilities in accordance with the Onsite Wastewater Management Systems Regulation MR 83/2003.

(d) Do not bury waste materials on Site.

(e) Do not dispose of solid or liquid wastes in drains or waterways.

D17.6 Hazardous Waste

D17.6.1 Definitions

(a) Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in the Dangerous Goods Handling and Transportation Act or regulations including hazardous materials and wastes.

(b) Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

(c) Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.

(d) Workplace Hazardous Materials Information System (WHMIS): a Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

D17.6.2 Materials Management

(a) Only bring on Site quantity of hazardous materials required to perform Work.

(b) Maintain MSDSs in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

(c) Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

D17.6.3 Storage and Handling

(a) Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

i) Sign storage areas;

ii) Store and handle flammable and combustible materials in accordance with current Manitoba and National Fire Code of Canada requirements;

iii) Do not transfer of flammable and combustible liquids in vicinity of open flames or heat-producing devices;

iv) Do not use flammable liquids having flash point below 38 degrees C, such as naphtha or gasoline as solvents or cleaning agents;

v) Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum; and

vi) Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

(b) Keep no more than 100 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

i) Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada (ULC) Certified Mark or Factory Mutual (FM) Approved Mark;

ii) Storage of quantities of flammable and combustible liquids exceeding 100 litres for Work purposes requires the written approval of the Contract Administrator; and

iii) Fuel storage exceeding 100 litres shall be a minimum distance of 100 metres from any water body and in compliance with the requirements of the Storage and Handling of Petroleum Products and Allied Products Manitoba Regulation 188/2001 of the Dangerous Goods Handling and Transportation Act.

(c) Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

i) Store hazardous materials and wastes in closed and sealed containers;

ii) Label containers of hazardous materials and wastes in accordance with WHMIS;

iii) Store hazardous materials and wastes in containers compatible with that material or waste;

iv) Segregate incompatible materials and wastes. Ensure that different hazardous materials or hazardous wastes are not mixed;

v) Store hazardous materials and wastes in secure storage area with controlled access;

vi) Maintain clear egress from storage area;

vii) Store hazardous materials and wastes in location that will prevent them from spilling into environment;

viii) Store products on spill trays or berms with 110% capacity;

ix) Do not store within 30 metres of a waterway or drain;

x) Have appropriate emergency spill response equipment available near storage area, including personal protective equipment; and

xi) Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began and disposal occurred. Maintain tipping and other disposal receipts.

(d) Report spills or accidents immediately:

i) to the Contract Administrator;

ii) to Manitoba Conservations Accident Reporting Line at 204-944-4888 in accordance with Manitoba Regulation 439/87 of the Dangerous Goods and Transportation Act; and

iii) Submit a written spill report to the Contract Administrator outlining cause and proposed corrective action and Manitoba Conservation as required. Provide copies of reports submitted to Manitoba Conservation to the Contract Administrator.

D17.6.4 Transportation

(a) Transport hazardous materials and wastes in accordance with the Manitoba Dangerous Goods Handling and Transportation Act.

i) Ensure that trained personnel handle, offer for transport, or transport dangerous goods;

ii) Use licensed carrier authorized by provincial authorities to accept subject material;

iii) Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations;

iv) Provide photocopy of shipping documents and waste manifests to the Contract Administrator;

v) Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to the Contract Administrator; and

vi) Report discharge, emission, or escape of hazardous materials immediately to the Contract Administrator and appropriate provincial authority. Take measures to control release.

D17.6.5 Disposal

(a) Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

i) Recycle hazardous wastes for which there is approved, cost effective recycling process available;

ii) Send hazardous wastes to authorized hazardous waste disposal or treatment facilities;

iii) Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited; and

iv) Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

D17.6.6 Erosion and Sediment Control

(a) Develop an erosion control plan to control negative impacts on water and air quality; plan should meet these objectives:

i) Prevent loss of soil during construction by storm water run-off and wind erosion;

ii) Protect against erosion from stockpiled topsoil aggregates; and

iii) Prevent sedimentation of the land drainage system and receiving streams with dust, particulate matter or eroded sediment.

(b) Supply, install, maintain and remove (as applicable and when no longer required) effective sediment control barriers and erosion control before starting Work that may result in the deposit of sediment into a ditch or water body to avoid potential impacts to fish and fish habitat.

i) Erosion and sediment control measures and installations include, as required, silt socks around storm drains, silt fence barriers, erosion control blanket, straw wattles, and geotextile fabric as appropriate; and

ii) Routinely inspect all erosion and sediment control measures and installations and immediately repair any deficiencies.

D17.6.7 Work to Adjacent Waterways

(a) Do not operate construction equipment in waterways and, where possible, avoid operating equipment within 30 metres of the waterway;

(b) Do not use waterway beds for borrow material;

(c) Do not dump excavated fill, waste material or debris in ditches or waterway;

(d) Design and construct temporary crossings to minimize erosion to waterways; and

(e) Dispose of excavated materials above the high water mark and 30 metres way from a watercourse.

D17.6.8 Drainage

(a) Provide temporary drainage and pumping as necessary to keep excavations and Site free from water;

(b) Do not pump water containing suspended materials into waterways, sewer or drainage systems; and

(c) Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

D17.6.9 Reducing Site Disturbances

(a) Do not disturb, in any way, the embankment slopes, roadway shoulders, and adjacent ground surfaces areas outside the limits of the construction areas including the approved lay down, staging and access unless written permission has been obtained from the Contract Administrator. Such written permission will be granted only if it can be shown that there is no alternative.

(b) Minimize disturbance of any undeveloped areas on Site and maintain existing Site grading where indicated and where possible.

i) Minimize stripping of topsoil and vegetation;

ii) Re-grade and plant vegetation on construction Site as soon as possible; and

iii) Avoid soil compaction where possible.

D17.6.10 Pollution Control

(a) Maintain temporary erosion and pollution control features installed under this contract.

(b) Maintain construction equipment in good working order. Control emissions from equipment.

(c) Cover or wet down dry materials and stockpiled soils to prevent blowing dust and debris. Provide dust control for the construction Site, temporary and access roads.

(d) Bring only clean fill, granular, rip rap and other similar construction materials to the project Site.

D17.6.11 CN Environmental Requirements

(a) Carry out all measures which CN, in its sole discretion considers necessary to keep the work free and clear of all environmental contaminants or residue results from the Contractor's occupation or use of the CN's premises (Premises), such condition to be confirmed by a post-termination environmental inspection/audit of the Premises to be carried out by CN. The Contractor shall be solely responsible for the cost of all work carried out to correct any environmental contamination which occurs on the Premises, or which occurs on other lands as a result of the Contractor's occupation or use of the Premises.

(b) CN shall have the right to enter upon the Premises, at all reasonable times and from time to time, in order to inspect the Premises and conduct or require the Contractor to conduct, at the Contractor's expense, such tests as may be required to verify the condition of the Premises.

(c) The Contractor shall be responsible to notify CN of all environmental contamination that the Contractor suspects is occurring on or escaping onto the Premises from adjacent lands or resulting from third party occupation.

(d) If the Contractor fails to correct any environmental contamination to the satisfaction of CN and any public authority having jurisdiction, CN may perform such work by its employees or agents. CN may charge the Contractor from time to time for all the costs incurred by CN in correcting such environmental contamination, plus fifteen per cent (15%) for overhead, and the Contract shall pay CN's invoice or invoices for such costs within ten (10) days of receipt of each invoice. In the event such remedial work is carried out by any public authority, the cost of such work shall be borne by the Contractor.

(e) Upon completion of the contract, the Contractor shall leave the Premises in a clean and tidy condition, free of any environmental contamination resulting from or occurring during the Contractor's occupation or use of the Premises. If the Contractor has installed any facility on or under the Premises, the Contractor shall remove such facility. The Contractor shall have the burden of proving that any environmental contamination has not resulted from or occurred during its occupation or use of the Premises.

(f) The responsibility of the Contractor to CN with respect to the environmental obligations contained herein shall continue to be enforceable by CN.

D18. WORK PRACTICES ON ASBESTOS-CEMENT PIPE

D18.1 Further to C.6.26(d), the Contractor's attention is directed to the possible health dangers associated with working with asbestos cement pipe and all work associated with the existing AC watermains shall conform to the following publications:

D18.2 The Contractor shall state in the "job specific safe work plan" the proposed procedure for working on AC Pipe. Contractor shall also provide proof of asbestos handling training or certification.

D18.3 Further to D17 – Environmental Protection Plan, the Contractor shall dispose of all asbestos containing waste materials at a disposal site licenced to accept asbestos.

SCHEDULE OF WORK

D19. COMMENCEMENT

D19.1 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.

D19.2 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 twenty-four (24) hour emergency response phone number specified in D5.2;
  (iv) the Safe Work Plan specified in D10;
  (v) evidence of the insurance specified in D11;
  (vi) the performance security specified in D12;
  (vii) the detailed prices specified in D13;
  (viii) the Subcontractor list specified in D14;

(ix) the equipment list specified in D15;

(x) the detailed work schedule specified in D16; and

(xi) the Environmental Protection Plan specified in D17; and

(xii) the job specific safe work plan specified in D18

(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.

(c) The Contractor has provided proof of CN Contractor Safety Training for each individual proposed to work on the Site to the Contract Administrator and;

(d) The Contractor has completed the CN Work Permit Application (Appendix B) and submitted with the permit fee to the Contract Administrator.

D19.3 The Contractor shall commence the Work on the Site within seven (7) days of receipt of the letter of intent.

D19.3.1 Work on 1164 Plessis Road and work on properties north of Kernaghan Avenue, (1225 and 1249 Plessis Road) shall not commence until the Contract Administrator confirms that arrangements have been made for access and/or possession. The City of Winnipeg is anticipating agreements will be in place by December 31, 2013.

D19.4 The City intends to award this Contract by January 17, 2014.

D19.4.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D20. RESTRICTED WORK HOURS

D20.1 All Work shall be carried out between the hours of 0700 and 2200 Monday to Friday and between 0900 and 2100 Saturday.

D20.2 No Work shall be performed outside the hours stated in D20.1 or on Sunday or Statutory or Civic holidays 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.

D20.3 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any Work to be performed outside the hours stated in D20.1.

D21. SCHEDULE RESTRICTIONS

D21.1 CN Protecting Foremen

(a) The Contractor will be required to provide qualified protecting foremen for the project as outlined in Specification E17 Co-ordination of Construction with CN.

D21.2 Privately Owned Forcemain Shutdowns

(a) The Contractor shall note that the 150 mm forcemain in the Plessis Road right-of-way south of Dugald Road is privately owned. Shutdown of this forcemain to connect the new forcemain is subject to the owner's schedule restrictions.

D21.3 Installation of sewer service pipe thru retaining wall structure

(a) The sewer service pipe between MH L.20 and CB.35 shall be installed after the retaining wall is constructed.

D22. WORK BY OTHERS

D22.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) Manitoba Telecom Services – Relocation/protection of existing lines;

(b) Shaw – Relocation/protection of existing lines;

(c) Shell Canada Products Limited – Relocation/protection of existing lines. Work has commenced on the relocation of the Shell lines around/under the proposed underpass with an anticipated completion date of March 14, 2014;

(d) Imperial Oil Limited – Relocation/protection of existing lines south of the valve station. Work has commenced on the relocation of the Imperial Oil lines under the shoofly embankment with an anticipated completion date of March 14, 2014;

(e) Imperial Oil Limited – Relocation/protection of existing lines north of the valve station. Work has commenced on the relocation of the Imperial Oil line north of the valve station with an anticipated completion date of March 14, 2014;

(f) Manitoba Hydro – Removal and relocation of existing hydro poles and street lighting;

(g) Manitoba Hydro – Installation of new street lighting;

(h) Manitoba Hydro – Relocation of a 12kV line and a 24 kV Feeder;

(i) CN – Fiber relocation

(j) CN – CN Signal and Communication Works; - Signal and communication cable and train movement control signal installation;

(k) City of Winnipeg Traffic Services – Erection and maintenance of temporary traffic control signs. Supply and installation of permanent traffic signs and bases;

(l) City of Winnipeg Traffic Signals – Removal/modification of existing traffic signals plant and Installation of new Traffic Signals plant;

(m) Contract 1 – Rail Shoofly Grade Preparation and Miscellaneous Wastewater Sewer, Watermain and Land Drainage Works. Work has commenced with an anticipated Total Performance Date of November 30, 2013; and

(n) Contract 2 – Shoofly Track Installation and Permanent Track Construction is expected to commence on January 2, 2014 with an anticipated Total Performance date of May 7, 2014. Phase I – Temporary Shoofly track construction for Contract 2 is anticipated to be complete March 14, 2014. Designated work areas on the southwest and northeast corners of Plessis Road and the CN Redditt Subdivision will be required for track assembly.

D23. SEQUENCE OF WORK

D23.1 Further to C6.1, the sequence of work shall be as follows:

D23.1.1 The Work shall be divided into six (6) phases. Each Phase shall be subdivided into stages. Stages are further subdivided into major items of work.

D23.1.2 **Phase I**

(a) Stage I – Pumping Station

i) Install groundwater monitoring/pumping wells, shoring and dewatering system for substructure;

ii) Construct cast-in-place substructure;

iii) Backfill excavation for substructure;

iv) Construct masonry and wood superstructure;

v) Install mechanical/HVAC systems;

vi) Install building electrical systems;

vii) Install process system equipment;

viii) Install instrumentation and controls system; and

ix) Commission Pumping Station.

(b) Stage 2 – Miscellaneous Underground Works

i) Demolish house at 1172 Plessis;
ii) Construct 450 WWS from MH.W4 to MH.W10;
iii) Construct 250 WWS from existing MH at MB Housing to MH.W12;
iv) Construct 525/600 mm LDS diversion from Paul Martin Drive MH.L10 to MH.L7; and
v) Construct 200 WM from near MH.W4 to near MH.L8.

(c) Stage 3 – Underpass Land Drainage Sewers Construction

i) Trenchless installation of 1050 mm LDS from MH.L15 to MH.L14 under shoofly and existing mainline track using only one setup.

(d) Stage 4 – Other Land Drainage System Construction

i) Construct two 1050 mm RCP culverts on south side of Dugald Road (Dugald Drain) under Plessis Road by open cut methods.

D23.1.3 **Phase II** (**To commence after Contract 2 Phase 1 is complete**)

(a) Stage 1 – Underpass Substructure and Retaining Walls

i) Excavate for abutment and pier construction to limits noted on drawings;
ii) Construct rock-socketed caissons, abutments and pier cap;
iii) Install steel sheet piles for upper and lower retaining walls under proposed girders/superstructure; and
iv) Install sheet piles north of structure with exception of in restricted construction zone north of the bridge shown on the construction drawings.

(b) Stage 2 – Dry Pond Construction Prior to Rail Shoofly Decommissioning

i) Site clearing and grubbing;
ii) Prepare site for fill material;
iii) Place suitable site material;
iv) Excavate surplus site material;
v) Remove abandoned Pumping Station foundation, reservoir, and associated piping; and
vi) Install pre-cast grated inlet/outlet structure.

D23.1.4 **Phase III**

(a) Stage A1 – Plessis Road Asphalt Reconstruction - Dugald Road to Approx. 300m South

i) Construct temporary pavement along existing southbound lanes;
ii) Construct 150 mm WWS Forcemain from former CN Express Terminal Building;
iii) Construct Northbound through lane, left turn lane and shoulder; and
iv) Construct median islands.

(b) Stage B1 – Plessis Road Concrete Reconstruction – 390 m south of Kernaghan Avenue to Pandora Avenue W

i) Imperial Oil line relocation north of the valve station (work by others) must be completed prior to construction of Northbound lanes south of the Northeast Access Road.
ii) Construct Northeast Access Road;
iii) Construction of temporary pavement along existing southbound lanes;
iv) Excavate Northbound lanes to subgrade;
v) Construct 375 and 450 LDS from MH.L18 to MH.L16 by open cut methods;
vi) Trenchless installation of 1050 mm LDS from MH.L15 to MH.L16;

vii) Construct associated catchbasins and sewer service pipe;
viii) Construct Northbound through lanes, and left turn lanes and approaches;
ix) Construct median islands; and
x) Construct Active Transportation Pathway.

(c) Stage A2 – Plessis Road Asphalt Reconstruction - Dugald Road to Approx. 300m South
i) Construct Southbound through lane;
ii) Construct Eastbound to Southbound right turn cut-off and island construction; and
iii) Construct Residential approaches and sidewalk.

(d) Stage B2 – Plessis Road Concrete Reconstruction – 390 m south of Kernaghan Avenue to Pandora Avenue W
i) Excavate Southbound lanes to subgrade;
ii) Construct associated catchbasins and sewer service pipe;
iii) Construct insulation on top of existing 150 mm WM between Kernaghan and Pandora;
iv) Construct Southbound through lanes and left turn lanes; and
v) Construct sidewalk.

(e) Stage 3 – Dugald Road Rehabilitation and Plessis Road Concrete Reconstruction – Dugald Road to 100m north of Dugald Road
i) Remove Overhead Sign Structure;
ii) Construct 600 RCP culvert under Dugald Road just W of Plessis Road by trenchless methods;
iii) Construct 450 mm LDS from CB.52 to MH.L1 by open cut methods;
iv) Construct 375 and 450 LDS from MH.L11 to MH.L14 by open cut methods;
v) Construct associated catchbasins and sewer service pipe;
vi) Construct Dugald Road Eastbound left turn lane to Northbound Plessis Road;
vii) Construct new Overhead Sign Structure;
viii) Construct Dugald Road Westbound deceleration lane to Northbound Plessis Road;
ix) Construct Northbound and Southbound Plessis Road through lanes and turn lanes;
x) Construct Dugald Road Westbound acceleration lane from Southbound Plessis Road;
xi) Construct Pumping Station discharges to Dry Pond and ditch west of the Pumping Station;
xii) Construct Pumping Southwest Access Road; and
xiii) Construct Southeast Access Road.

D23.1.5 **Phase IV**

(a) Stage 1 – Underpass Superstructure and Retaining Walls
i) Install superstructure (bearings, steel TPG spans, trainman's walkway, waterproofing); and
ii) Install sheet piles in restricted constructed zone north of bridge after oil lines have been relocated by others.

(b) Stage 2 – Rail Construction
i) Install remaining turnouts;
ii) Construct track on bridge using previously built track panels; and
iii) Complete cut-overs and re-establish service on maintracks over new structure.

D23.1.6 **Phase V**

(a) Stage 1 – Rail Removal
   i) Remove temporary shoofly, WU01 and WM01 track and salvage material;
   ii) Remove shoofly embankment and shape / reclaim material to form access roads and turnout pads; and
   iii) Stockpile remaining embankment material.

(b) Stage 2 – Retaining Walls and Excavation
   i) Install steel sheetpiles south of bridge structure; and
   ii) Excavate beneath bridge structure and at shoofly location to subgrade.

(c) Stage 3 – Dry Pond Construction After Rail Shoofly Decommissioning
   i) Prepare site for fill material;
   ii) Place suitable site material; and
   iii) Excavate surplus site material.

(d) Stage C1 – Underpass Roadway Reconstruction
   i) Construct associated catchbasins and sewer service pipe; and
   ii) Construct Southbound Plessis Road from 100m north of Dugald Road to 390m south of Kernaghan Avenue with temporary pavement.

D23.1.7 **Phase VI**

(a) Stage 1 – Underpass Roadway Reconstruction
   i) Construct associated catchbasins and sewer service pipe;
   ii) Construct Northbound Plessis Road from 100m north of Dugald Road to160 m south of Kernaghan Avenue; and
   iii) Remove temporary pavement and construct permanent pavement Southbound Plessis Road from 100m north of Dugald Road to 390m south of Kernaghan Avenue.

(b) Stage 2 – Miscellaneous Structural Works
   i) Construct concrete cladding on upper and lower retaining walls;
   ii) Construct drainage, median slab, traffic barriers, concrete caps, and sidewalk/ATP slabs;
   iii) Install “Welcome to Transcona” signs; and
   iv) Install pedestrian handrails and chain link fence.

(c) Stage 3 – Landscaping Works
   i) Construct rest area with paving stones;
   ii) Install soil amendments, finish grading and seed;
   iii) Install topsoil, finish grading and sod;
   iv) Install plant material;
   v) Install site furnishings; and
   vi) Long term maintenance of plant material.

(d) Stage 4 – Miscellaneous Removals
   i) Demolition of house at 1164 Plessis Road;
   ii) Demolition of house at 1168 Plessis Road; and
   iii) Removal of raised crosswalks and speed tables on Bournais and Rougeau.

(e) Stage 5 – Site Restoration
   i) Upon completion of the work and demobilization, the Contractor shall restore laydown area(s) and site access roads.

D24. BUILDING CANADA FUND – MAJOR INFRASTRUCTURE COMPONENT

D24.1 Funding for the Plessis Road Twinning and Grade Separation at CN Redditt Subdivision Project (also known as the Plessis Road Underpass Project) is being provided to the City of Winnipeg by the Government of Canada ("Canada") and The Province of Manitoba ("Manitoba"). As required by the City's funding agreements with Canada and Manitoba, the Contractor must:

(a) Establish and maintain for a period of at least six (6) years following the date of substantial completion of the Plessis Road Twinning and Grade Separation at CN Redditt Subdivision Project proper and accurate financial accounts and records, including but not limited to its contracts, invoices, statements, receipts and vouchers, (including supporting documents), prepared in accordance with generally accepted accounting principles, as are necessary to properly account for the services or goods provided by the Contractor to the City;

(b) Permit The City, Manitoba, Canada, the Auditor General of Canada, and/or their designated representatives, to the extent permitted by law, at all times, to inspect the terms of the Contract and any records and accounts respecting the Project, and to have free access to the Project sites and any documentation relevant for the purpose of audit;

(c) Permit the City, Canada and/or Manitoba and its agents, and their respective authorized representatives, to monitor the Work and to inspect and audit the accounting and other records relating to the Work for a period of six (6) years following June 30, 2015;

(d) Indemnify and save Manitoba and its Ministers, officers, employees and agents harmless from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from the contract or from the goods or services provided, or required to be provided, by the Contractor, except those resulting from the negligence of any of Manitoba's Ministers, officers, servants, employees or agents;

(e) Respect and comply with all applicable legislation and standards, whether federal, provincial or municipal, including (without limitation) labour, environmental, and human rights legislation;

(f) Consent to the City providing a copy of the Contract to Manitoba and its agent upon request from Manitoba; and

(g) Consent to the City providing Manitoba and its agents with the results of the City's inspections and audits of the Work and of the Contractor's accounts and records.

D25. CRITICAL STAGES

D25.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Critical Stage 1 – Phase I, Stage 1 as described in D23.1.2 shall be completed by September 30, 2014. Commissioning of Pumping Station is required to provide an adequate test period during non-winter conditions.

(b) Critical Stage 2 - Phase IV, Stage 2 as described in D23.1.5 shall be completed by September 30, 2014. The opening of the permanent track shall occur when the track is approved by CN for operations and the bridge has been approved by the Contract Administrator and CN.

(c) Critical Stage 3 – Phase I through Phase V as described in D23 (with the exception of the northbound lanes and sidewalk from 100m north of Dugald Road to 390m south of Kernaghan Avenue) shall be completed and open to traffic by December 31, 2014.

D25.2 When the Contractor considers the Work associated with each Critical Stage described in D25.1 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.

D25.3 The dates on which each Critical Stage described in D25.1 Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of each Critical Stage described in D25.1 has been achieved.

D26. SUBSTANTIAL PERFORMANCE

D26.1 The Contractor shall achieve Substantial Performance by September 1, 2015.

D26.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D26.3 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.

D27. TOTAL PERFORMANCE

D27.1 The Contractor shall achieve Total Performance by September 30, 2015.

D27.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D27.3 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.

D28. LIQUIDATED DAMAGES

D28.1 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 the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Critical Stage 1 – Five thousand dollars ($5,000);

(b) Critical Stage 2 – Five thousand dollars ($5,000);

(c) Critical Stage 3 – Five thousand dollars ($5,000);

(d) Substantial Performance – Five thousand dollars ($5,000);

(e) Total Performance – One thousand dollars ($1,000).

D28.2 The amounts specified for liquidated damages in D28.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D28.3 Should the Contractor fail to achieve more than one Critical Stage date the liquidated damages will not be compounded. Liquidated Damages will be charged in sequence until each Critical Stage is met.

D28.4 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D29. SCHEDULED MAINTENANCE

D29.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Maintenance of Sod Area as specified in CW-3510.

(b) Maintenance of Trees and Shrubs and Planting Beds as specified in E90.

(c) Reflective Crack Maintenance (during warranty period) as specified in CW 3250.

D29.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D30. JOB MEETINGS

D30.1 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.

D30.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D31. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D31.1 For the purpose of determining Prime Contractor, Contract 1 shall be all underground utility works and the construction of the rail embankments up to the top of the sub-ballast until the date of Total Performance of Bid Opportunity No. 342-2013, Contract 2 shall be the supply and installation of ballast and all track material for the shoofly track construction and the permanent track works and Contract 3 will be all other works relating to the underpass construction.

D31.2 Further to C6.26, the Prime Contractor shall serve as and will have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba) as follows:

(a) Contractor for Contract 2: from the commencement of the Work of Contract 2 until the commencement on Site of the Work of Contract 3.

(b) Contractor for Contract 3: upon commencement on Site of the Work of Contract 3.

D31.2.1 The time and date of the commencement on Site of the Work of Contract 3 shall be the time and date determined by the Contract Administrator and stated in a notice to the contractors.

D32. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D32.1 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.

MEASUREMENT AND PAYMENT

D33. PAYMENT

D33.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D34. WARRANTY

D34.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter, except where longer warranty periods are specified in the Specifications, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D34.2 Notwithstanding C13.2 or D34.1, 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.

D34.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

BID OPPORTUNITY NO. 712-2013

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

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

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 712-2013

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

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

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM I: DETAILED PRICES
(See D13)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
	Pumping Station Excavation, Shoring, Dewatering and Substructure					
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
	Pumping Station Superstructure					
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
	Pumping Station Mechanical and HVAC Systems					
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						

FORM I: DETAILED PRICES
(See D13)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
	Pumping Station Building Electrical Systems					
27.						
28.						
29.						
30.						
31.						
32.						
33.						
34.						
35.						
	Pumping Station Instrumentation and Control Systems					
36.						
37.						
38.						
39.						
40.						
41.						
42.						
43.						
44.						
	Pumping Station Process Systems					
45.						
46.						
47.						
48.						
49.						

FORM J: SUBCONTRACTOR LIST
(See D14)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

Portion of the Work	Name	Address
ROADWORKS:		
Supply of Materials:		
Subdrains		
Geotextile Fabric		
Sub-base and base course		
Concrete		
Asphalt		
Installation/Placement:		
Subdrains		
Geotextile Fabric		
Sub-base and base course		
Concrete		
Asphalt		
UNDERPASS STRUCTURES:		
Supply of Materials:		
Rock-Socketed Caisson Steel Casings		
Steel Sheet Pile Retaining Walls		
Granular Backfill		
Structural Concrete		
Reinforcing Steel		
Spherical Bearings		
Through Plate Girder (TPG) Spans		
Waterproofing Membrane		
Subdrains		
Chain Link Fence		
Aluminum Pedestrian Handrail		
Welcome to Transcona Sign		

FORM J: SUBCONTRACTOR LIST
(See D14)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

Portion of the Work	Name	Address
Installation/Placement:		
Rock-Socketed Caisson Drilling		
Steel Sheet Pile Retaining Walls		
Granular Backfill		
Structural Concrete		
Reinforcing Steel		
Spherical Bearings		
Through Plate Girder (TPG) Spans		
Waterproofing Membrane		
Subdrains		
Chain Link Fence		
Aluminum Pedestrian Handrail		
UNDERGROUND WORKS:		
Supply of Materials:		
Catchpits, Catchbasins and Manholes		
Frames and Covers		
Culverts – Corrugated Steel Pipe		
Land Drainage Sewer		
Wastewater Sewer		
Forcemain Sewer		
Watermain		
Hydrants		
Valves		
Tees		
Couplers		
Sluice Gate		
Knife Gate		

FORM J: SUBCONTRACTOR LIST
(See D14)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

Portion of the Work	Name	Address
Installation/Placement:		
Catchpits, Catchbasins and Manholes		
Frames and Covers		
Culverts – Corrugated Steel Pipe		
Land Drainage Sewer		
Wastewater Sewer		
Forcemain Sewer		
Watermain		
Hydrants		
Valves		
Tees		
Couplers		
Sluice Gate		
Knife Gate		
PUMPING STATION		
Supply of Materials:		
Substructure Works		
Superstructure		
Mechanical		
HVAC Systems		
Electrical Systems		
Instrumentation		
Control Systems		
Process Systems		
Installation/Placement:		
Substructure Works		

FORM J: SUBCONTRACTOR LIST
(See D14)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

Portion of the Work	Name	Address
Superstructure		
Mechanical		
HVAC Systems		
Electrical Systems		
Instrumentation		
Control Systems		
Process Systems		
DRY POND		
Supply of Materials:		
Precast Ditch Inlet Structure		
Safety Grate		
Safety Railing		
Installation/Placement:		
Precast Ditch Inlet Structure		
Safety Grate		
Safety Railing		
RAIL CONSTRUCTION		
Supply of Materials:		
136 lb Rail		
No. 1 Treated Hardwood Ties		
Splice Bars		
Plates/OTM (Other Track Material)		
Installation/Placement:		
136 lb Rail		
No. 1 Treated Hardwood Ties		
Splice Bars		
Plates/OTM (Other Track Material)		

FORM J: SUBCONTRACTOR LIST
(See D14)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

Portion of the Work	Name	Address
LANDSCAPING		
Supply of Materials:		
Topsoil		
Plant Material – Trees and Shrubs		
Seed Mixes		
Bluegrass/Fescue Sod		
Interlocking Paving Stones		
Site Furnishings		
Installation/Placement:		
Topsoil		
Plant Material – Trees and Shrubs		
Seed Mixes		
Bluegrass/Fescue Sod		
Interlocking Paving Stones		
Site Furnishings		

FORM K: EQUIPMENT
(See D15)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D15)

PLESSIS ROAD TWINNING AND GRADE SEPARATION AT CN REDDITT SUBDIVISION: PLESSIS ROAD RECONSTRUCTION, UNDERPASS STRUCTURES, PUMPING STATION, LAND DRAINAGE SEWER AND MISCELLANEOUS UNDERGROUND AND LANDSCAPING WORKS

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

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 Appendix "B" CN Safety Requirements & Work Permit Form take precedence on all matters within CN property.

E1.4 The following are applicable to the Work:

Specification No.	Specification Title
DIVISION 04	**– MASONRY**
04 04 00	COMMON WORK RESULTS FOR MASONRY
04 05 12	MASONRY MORTAR AND GROUT
04 05 19	MACONRY ANCHORAGE AND REINFORCING
04 22 00	CONCRETE UNIT MASONRY
04 43 26	DIMENSION STONE VENEER
DIVISION 05	**– METALS**
05 50 00	METAL FABRICATIONS
DIVISION 06	**– WOOD, PLASTICS, AND COMPOSITES**
06 05 73	WOOD TREATMENT
06 10 00	ROUGH CARPENTRY
06 17 53	SHOP-FABRICATED WOOD TRUSSES
06 60 00	PLASTIC FABRICATION
DIVISION 07	**– THERMAL & MOISTURE PROTECTION**
07 11 13	BITUMINOUS DAMPPROOFING
07 21 13	BOARD INSULATION
07 21 16	BLANKET INSULATION
07 26 00	AIR VAPOUR BARRIERS
07 46 13	PREFORMED METAL SIDING
07 61 00	SHEET METAL ROOFING
07 84 00	FIRE STOPPING
07 92 00	JOINT SEALANTS
DIVISION 08	**– OPENINGS**
08 11 00	METAL DOORS AND FRAMES
08 71 00	DOOR HARDWARE

City of Winnipeg Drawing No.	Consultant Drawing No.	Drawing Name/Title
GENERAL		
U238-2014-1901	G-0001	COVER SHEET
U238-2014-1902	G-0002	DRAWING LIST
U238-2014-1903	G-0003	SITE PLAN
U238-2014-1904	G-0004	INSTRUMENTATION LOCATION PLAN
BRIDGE		
U238-2014-2001	CS-0001	BRIDGE & RETAINING WALLS GENERAL NOTES
U238-2014-2002	CS-0002	GENERAL ARRANGEMENT
U238-2014-2003	CS-0003	GRADING, SLOPE PROTECTION AND DRAINAGE
U238-2014-2004	CS-0004	BRIDGE STAGING PLAN – SHEET 1
U238-2014-2005	CS-0005	BRIDGE STAGING PLAN – SHEET 2
U238-2014-2006	CS-0006	BRIDGE STAGING PLAN – SHEET 3
U238-2014-2007	CS-0007	UTILITIES & ROAD PROFILES
U238-2014-2008	CS-0008	BORE HOLE LOGS - SHEET 1
U238-2014-2009	CS-0009	BORE HOLE LOGS - SHEET 2
U238-2014-2010	CS-0010	BORE HOLE LOGS - SHEET 3
U238-2014-2011	CS-0011	CAISSON LAYOUT
U238-2014-2012	CS-0012	SU1 & SU3 ABUTMENT CONCRETE
U238-2014-2013	CS-0013	SU1 & SU3 ABUTMENT REINFORCING
U238-2014-2014	CS-0014	SU2 PIER CONCRETE
U238-2014-2015	CS-0015	SU2 PIER REINFORCING
U238-2014-2016	CS-0016	STEEL FRAMING PLAN & ELEVATION
U238-2014-2017	CS-0017	END FLOOR BEAMS
U238-2014-2018	CS-0018	INTERMEDIATE FLOOR BEAMS
U238-2014-2019	CS-0019	BALLAST & DECK PLATE PLAN
U238-2014-2020	CS-0020	MISCELLANEOUS SECTION & DETAILS
U238-2014-2021	CS-0021	BEARINGS
U238-2014-2022	CS-0022	WELCOME TO TRANSCONA SIGNS
RETAINING WALLS		
U238-2014-2023	CS-0023	RETAINING WALL LAYOUT
U238-2014-2024	CS-0024	BORE HOLE LOGS
U238-2014-2025	CS-0025	UPPER WEST RETAINING WALL
U238-2014-2026	CS-0026	LOWER WEST RETAINING WALL – SHEET 1
U238-2014-2027	CS-0027	LOWER WEST RETAINING WALL – SHEET 2
U238-2014-2028	CS-0028	UPPER EAST RETAINING WALL
U238-2014-2029	CS-0029	LOWER EAST RETAINING WALL
U238-2014-2030	CS-0030	CAP AND SIDEWALK – ATP SLAB LAYOUT
U238-2014-2031	CS-0031	WEST CAP, SIDEWALK SLAB AND DETAILS
U238-2014-2032	CS-0032	EAST CAP AND ATP SLAB
U238-2014-2033	CS-0033	CHAIN LINK FENCE AND CAP DETAILS
U238-2014-2034	CS-0034	TRAFFIC BARRIERS
U238-2014-2035	CS-0035	PEDESTRIAN AND BICYCLE HANDRAIL DETAILS – SHEET 1
U238-2014-2036	CS-0036	PEDESTRIAN AND BICYCLE HANDRAIL DETAILS – SHEET 2
U238-2014-2037	CS-0037	PEDESTRIAN AND BICYCLE HANDRAIL DETAILS – SHEET 3
ROAD		
U238-2014-2101	CT-0001	GENERAL ARRANGEMENT
U238-2014-2102	CT-0002	REMOVALS - PLESSIS - STA 1+715 TO 1+900
U238-2014-2103	CT-0003	REMOVALS - PLESSIS - STA 1+900 TO 2+090, DUGALD 0+445 TO 0+565
U238-2014-2104	CT-0004	REMOVALS - PLESSIS - STA 2+090 TO 2+275
U238-2014-2105	CT-0005	REMOVALS - PLESSIS - STA 2+275 TO 2+420

City of Winnipeg Drawing No.	Consultant Drawing No.	Drawing Name/Title
ROAD (Con't)		
U238-2014-2106	CT-0006	REMOVALS - PLESSIS - STA 2+420 TO 2+580
U238-2014-2107	CT-0007	REMOVALS - PLESSIS - STA 2+580 TO 2+685 AND KERNAGHAN
U238-2014-2108	CT-0008	REMOVALS - PLESSIS - STA 2+685 TO 2+870
U238-2014-2109	CT-0009	REMOVALS - DUGALD - STA 0+270 TO 0+445
U238-2014-2110	CT-0010	REMOVALS - DUGALD - STA 0+565 TO 0+740
U238-2014-2111	CT-0011	TRAFFIC STAGING - STAGE A1
U238-2014-2112	CT-0012	TRAFFIC STAGING - STAGE A2
U238-2014-2113	CT-0013	TRAFFIC STAGING - STAGE B1
U238-2014-2114	CT-0014	TRAFFIC STAGING - STAGE B2
U238-2014-2115	CT-0015	TRAFFIC STAGING - STAGE C1
U238-2014-2116	CT-0016	TRAFFIC STAGING - STAGE C2
U238-2014-2117	CT-0017	CONTROL LINE GEOMETRY - PLESSIS (1 OF 2)
U238-2014-2118	CT-0018	CONTROL LINE GEOMETRY - PLESSIS (2 OF 2)
U238-2014-2119	CT-0019	CONTROL LINE GEOMETRY - DUGALD
U238-2014-2120	CT-0020	CONTROL LINE GEOMETRY - KERNAGHAN
U238-2014-2121	CT-0021	CONTROL LINE GEOMETRY - ACCESS ROADS
U238-2014-2122	CT-0022	PLAN-PROFILE - PLESSIS - STA 1+685 TO 1+845 (SOUTHBOUND)
U238-2014-2123	CT-0023	PLAN-PROFILE - PLESSIS - STA 1+685 TO 1+845 (NORTHBOUND)
U238-2014-2124	CT-0024	PLAN-PROFILE - PLESSIS - STA 1+845 TO 2+005 (SOUTHBOUND)
U238-2014-2125	CT-0025	PLAN-PROFILE - PLESSIS - STA 1+845 TO 2+005 (NORTHBOUND)
U238-2014-2126	CT-0026	PLAN-PROFILE - PLESSIS - STA 2+005 TO 2+155 (PLAN)
U238-2014-2127	CT-0027	PLAN-PROFILE - PLESSIS - STA 2+005 TO 2+155 (PROFILE-SB)
U238-2014-2128	CT-0028	PLAN-PROFILE - PLESSIS - STA 2+005 TO 2+155 (PROFILE-NB)
U238-2014-2129	CT-0029	PLAN-PROFILE - PLESSIS - STA 2+155 TO 2+315 (PLAN)
U238-2014-2130	CT-0030	PLAN-PROFILE - PLESSIS - STA 2+155 TO 2+315 (PROFILE-SB)
U238-2014-2131	CT-0031	PLAN-PROFILE - PLESSIS - STA 2+155 TO 2+315 (PROFILE-NB)
U238-2014-2132	CT-0032	PLAN-PROFILE - PLESSIS - STA 2+315 TO 2+475 (PLAN)
U238-2014-2133	CT-0033	PLAN-PROFILE - PLESSIS - STA 2+315 TO 2+475 (PROFILE-SB)
U238-2014-2134	CT-0034	PLAN-PROFILE - PLESSIS - STA 2+315 TO 2+475 (PROFILE-NB)
U238-2014-2135	CT-0035	PLAN-PROFILE - PLESSIS - STA 2+475 TO 2+635
U238-2014-2136	CT-0036	PLAN-PROFILE - PLESSIS - STA 2+635 TO 2+795
U238-2014-2137	CT-0037	PLAN-PROFILE - PLESSIS - STA 2+795 TO 2+955
U238-2014-2138	CT-0038	PLAN-PROFILE - DUGALD - STA 0+285 TO 0+445
U238-2014-2139	CT-0039	PLAN-PROFILE - DUGALD - STA 0+445 TO 0+605
U238-2014-2140	CT-0040	PLAN-PROFILE - DUGALD - STA 0+605 TO 0+760
U238-2014-2141	CT-0041	PROFILE - DUGALD EAST BOUND- RIGHT TURN SMART CHANNEL
U238-2014-2142	CT-0042	PROFILE - PLESSIS AND DUGALD - RIGHT TURN CUT OFF
U238-2014-2143	CT-0043	PLAN-PROFILE - KERNAGHAN
U238-2014-2144	CT-0044	PLAN-PROFILE - NORTHEAST ACCESS ROAD (1 OF 2)
U238-2014-2145	CT-0045	PLAN-PROFILE - NORTHEAST ACCESS ROAD (2 OF 2)
U238-2014-2146	CT-0046	PLAN-PROFILE - SOUTHEAST ACCESS ROAD
U238-2014-2147	CT-0047	PLAN-PROFILE - PUMPING STATION ACCESS ROAD
U238-2014-2148	CT-0048	PLESSIS SECTIONS (1 OF 6)
U238-2014-2149	CT-0049	PLESSIS SECTIONS (2 OF 6)
U238-2014-2150	CT-0050	PLESSIS SECTIONS (3 OF 6)
U238-2014-2151	CT-0051	PLESSIS SECTIONS (4 OF 6)
U238-2014-2152	CT-0052	PLESSIS SECTIONS (5 OF 6)
U238-2014-2153	CT-0053	PLESSIS SECTIONS (6 OF 6)
U238-2014-2154	CT-0054	DUGALD SECTIONS
U238-2014-2155	CT-0055	DETAILS
U238-2014-2156	CT-0056	CONCRETE JOINT LAYOUT (1 OF 6)
U238-2014-2157	CT-0057	CONCRETE JOINT LAYOUT (2 OF 6)
U238-2014-2158	CT-0058	CONCRETE JOINT LAYOUT (3 OF 6)
U238-2014-2159	CT-0059	CONCRETE JOINT LAYOUT (4 OF 6)
U238-2014-2160	CT-0060	CONCRETE JOINT LAYOUT (5 OF 6)

City of Winnipeg Drawing No.	Consultant Drawing No.	Drawing Name/Title
ROAD (Con't)		
U238-2014-2161	CT-0061	CONCRETE JOINT LAYOUT (6 OF 6)
U238-2014-2162	CT-0062	CRACH CUSHION WITH CONCRETE BACKUP
U238-2014-2063	CT-0063	TRANSCONA BIZ PEDESTAL RELOCATION
OVERHEAD SIGN		
S776-2013-01	CT-0064	S776 – DUGALD ROAD EB WEST OF PLESSIS
S776-2013-02	CT-0065	S776 – FABRICATION DETAILS
S776-2013-03	CT-0066	S776 – CRASH CUSHION WITH TENSION STRUT BACKUP
RAIL		
U238-2014-2201	CR-1101	SHOOFLY REMOVAL AND FINAL CONFIGURATION OVERALL PLAN, LEGEND AND GENERAL NOTES
U238-2014-2202	CR-1102	SHOOFLY REMOVAL AND FINAL CONFIGURATION PLAN & PROFILE STA.397+100 TO 397+320
U238-2014-2203	CR-1103	SHOOFLY REMOVAL AND FINAL CONFIGURATION PLAN & PROFILE STA.396+750 TO 397+100
U238-2014-2204	CR-1104	SHOOFLY REMOVAL AND FINAL CONFIGURATION PLAN & PROFILE STA.396+400 TO 396+750
U238-2014-2205	CR-1105	SHOOFLY REMOVAL AND FINAL CONFIGURATION PLAN & PROFILE STA.396+280 TO 396+400
U238-2014-2206	CR-1106	SHOOFLY REMOVAL AND FINAL CONFIGURATION OVERALL PLAN & PROFILE STA.396+280 TO 397+320
U238-2014-2241	CR-4101	SHOOFLY REMOVAL AND FINAL CONFIGURATION STANDARD DETAIL – TYPICAL SECTIONS
U238-2014-2242	CR-4102	SHOOFLY REMOVAL AND FINAL CONFIGURATION STANDARD DETAIL – TYPICAL SECTIONS
U238-2014-2243	CR-4103	SHOOFLY REMOVAL AND FINAL CONFIGURATION STANDARD DETAIL – TYPICAL SECTIONS
PUMPING STATION & DRY POND		
CIVIL		
U238-2014-2301	C-1001	KEY PLAN – UTILITIES
U238-2014-2302	C-1002	PLESSIS ROAD – LDS – DUGALD ROAD TO 395m SOUTH OF KERNAGHAN AVENUE
U238-2014-2303	C-1003	PLESSIS ROAD – LDS – 195m NORTH OF DUGALD ROAD TO 120m SOUTH OF KERNAGHAN AVENUE
U238-2014-2304	C-1004	PLESSIS ROAD – WWS & WM – 195m NORTH OF DUGALD ROAD TO 120m SOUTH OF PEAKE AVENUE
U238-2014-2305	C-1005	PLESSIS ROAD / NORTH EAST ACCESS ROAD – LDS – 105m NORTH OF DUGALD ROAD TO 180m SOUTH OF KERNAGHAN AVENUE
U238-2014-2306	C-1006	PLESSIS ROAD – LDS – 470m NORTH OF DUGALD ROAD TO 40m SOUTH OF PEAKE AVENUE
U238-2014-2307	C-1007	PLESSIS ROAD – LDS – 45m NORTH OF BARRY AVENUE TO PANDORA AVENUE
U238-2014-2308	C-1008	PLESSIS ROAD – FRM & LDS – 275m SOUTH OF DUGALD ROAD TO DUGALD ROAD
U238-2014-2309	C-1009	DUGALD ROAD – LDS – PLESSIS ROAD TO 245m EAST OF PLESSIS ROAD
U238-2014-2310	C-1010	PLESSIS ROAD DRY POND – PLAN
U238-2014-2311	C-4001	PLESSIS ROAD DRY POND – SECTIONS AND DETAILS
U238-2014-2312	C-4002	MISCELLANEOUS UNDERGROUND DETAILS
U238-2014-2313	C-6001	LAND DRAINAGE SYSTEM - STRUCTURE & LOCATION SCHEDULE

City of Winnipeg Drawing No.	Consultant Drawing No.	Drawing Name/Title
U238-2014-2314	C-6002	LAND DRAINAGE SYSTEM - STRUCTURE & LOCATION SCHEDULE
U238-2014-2315	C-6003	LAND DRAINAGE SYSTEM - STRUCTURE & LOCATION SCHEDULE

SUPER- STRUCTURE

U238-2014-2320	SS-0001	PUMPING STATION - SITE PLAN
U238-2014-2321	SB-0001	STRUCTURAL SUPERSTRUCTURE – GENERAL NOTES AND ABBREVIATIONS
U238-2014-2322	SB-0002	STRUCTURAL SUPERSTRUCTURE – SCHEDULES AND MASONRY STANDARD DETAILS
U238-2014-2323	SB-0003	STRUCTURAL SUPERSTRUCTURE – MAIN FLOOR AND REFLECTED CEILING PLAN
U238-2014-2324	SB-0004	STRUCTURAL SUPERSTRUCTURE – ROOF AND ROOF FRAMING PLANS
U238-2014-2325	SB-0005	STRUCTURAL SUPERSTRUCTURE – EXTERIOR ELEVATIONS
U238-2014-2326	SB-0006	STRUCTURAL SUPERSTRUCTURE – SECTIONS
U238-2014-2327	SB-0007	STRUCTURAL SUPERSTRUCTURE – WALL SECTIONS
U238-2014-2328	SB-0008	STRUCTURAL SUPERSTRUCTURE – WALL OPENING STD DETAILS

STRUCTURAL

U238-2014-2331	S-1001	PUMPING STATION – SUB-STRUCTURE – SECTIONS AND DETAILS 1
U238-2014-2332	S-1002	PUMPING STATION – SECTIONS AND DETAILS 2
U238-2014-2333	S-1003	PUMPING STATION – SECTIONS AND DETAILS 3
U238-2014-2334	S-1004	PUMPING STATION – SECTIONS AND DETAILS 4
U238-2014-2335	S-1005	PUMPING STATION – SECTIONS AND DETAILS 5
U238-2014-2336	S-1006	PUMPING STATION – FOUNDATION PLAN – SECTIONS AND DETAILS
U238-2014-2337	S-1007	PUMPING STATION – SUBSTRUCTURE – REINFORCING SECTIONS 1
U238-2014-2338	S-1008	PUMPING STATION – SUBSTRUCTURE – REINFORCING SECTIONS 2
U238-2014-2339	S-1009	PUMPING STATION – HANDRAIL DETAILS 1 SHEET 1
U238-2014-2340	S-1010	PUMPING STATION – HANDRAIL DETAILS 2 SHEET 2

MECHANICAL

U238-2014-2341	M-0001	MECHANICAL - LEGENDS, NOTES AND ABBREVIATIONS
U238-2014-2342	M-0002	MECHANICAL - MAIN FLOOR & WET WELL PLANS
U238-2014-2343	M-0003	MECHANICAL - SECTIONS
U238-2014-2344	M-0004	MECHANICAL - DETAILS & SCHEMATICS
U238-2014-2345	M-0005	MECHANICAL – SCHEDULES

ELECTRICAL

U238-2014-2351	E-0001	ELECTRICAL LEGEND
U238-2014-2352	E-0002	ELECTRICAL SITE PLAN
U238-2014-2353	E-0003	ELECTRICAL - LIGHTING MAIN FLOOR PLAN
U238-2014-2354	E-0004	ELECTRICAL - POWER AND INSTRUMENT FLOOR PLAN
U238-2014-2355	E-0005	ELECTRICAL - POWER AND INSTRUMENT SECTIONS
U238-2014-2356	E-0006	ELECTRICAL - HAZARDOUS AREA DETAILS
U238-2014-2357	E-0007	ELECTRICAL - SCHEDULES AND DETAILS
U238-2014-2358	E-0008	ELECTRICAL - SCHEMATICS
U238-2014-2359	E-0009	ELECTRICAL - MCC ELEVATION

City of Winnipeg Drawing No.	Consultant Drawing No.	Drawing Name/Title
PROCESS MECHANICAL		
U238-2014-2371	P-1001	PUMPING STATION – PROCESS MECHANICAL – LEGEND & ABBREVIATIONS
U238-2014-2372	P-1002	PUMPING STATION – PROCESS MECHANICAL – STANDARD DETAILS
U238-2014-2373	P-1003	PUMPING STATION – PROCESS MECHANICAL – PLANS & DETAILS
U238-2014-2374	P-1004	PUMPING STATION – PROCESS MECHANICAL – SECTIONS
U238-2014-2375	P-1005	PUMPING STATION – PROCESS & INSTRUMENTATION DIAGRAM
LANDSCAPE		
U238-2014-2401	L-0001	LANDSCAPING - PLESSIS ROAD - STA 1+170 TO 2+040
U238-2014-2402	L-0002	LANDSCAPING - PLESSIS ROAD - STA 2+040 TO 2+385
U238-2014-2403	L-0003	LANDSCAPING - PLESSIS ROAD - STA 2+385 TO 2+650
U238-2014-2404	L-0004	LANDSCAPING - PLESSIS ROAD - STA 2+650 TO 2+925
U238-2014-2405	L-0005	LANDSCAPING - DUGALD ROAD - STA 0+275 TO 0+450 AND STA 0+575 TO STA 0+725
U238-2014-2406	L-0006	LANDSCAPING - DRY POND AND PUMPING STATION
U238-2014-2407	L-0007	LANDSCAPING - ENLARGEMENTS
U238-2014-2408	L-0008	LANDSCAPING - DETAILS
U238-2014-2409	L-0009	LANDSCAPING – DETAILS
U238-2014-2410	L-0010	LANDSCAPING – RETAINING WALL GRAPHIC DETAILS

E2. GEOTECHNICAL REPORT

E2.1 Further to C3.1, test hole logs from the March 2013 AECOM geotechnical report and from the supplemental investigation of August 2013 are provided to aid the Contractor's evaluation of the existing soil conditions. The summary of the test caisson investigation is provided to assist the Contractor in equipment selection and proper construction practices. The test hole logs, Summary of Test Caisson Investigation dated September 5, 2013 and CN Railway Detour Stability Analysis memorandums dated April 22, 2013 and October 25, 2013 are contained in Appendix 'A'. The information presented is considered accurate at the locations and time of drilling as outlined in the Appendix. However, variations in soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences. The complete AECOM geotechnical report and AECOM investigation memo may be viewed at the Contract Administrator's Office upon request.

E3. SUBMITTALS AND SHOP DRAWINGS

E3.1 Submittals

E3.1.1 Further to CW 1110, all submissions must be in metric units. Where data is in imperial units, the correct metric values shall also be shown on the submissions for Contract Administrator review.

E3.2 Shop Drawings

E3.2.1 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.

E3.2.2 Original drawings shall be prepared by Contractor, Subcontractor, supplier, distributor or manufacturer to illustrate appropriate portion of Work including fabrication, layout, setting or erection details as specified in appropriate sections.

E3.2.3 Shop Drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

(a) Metal Fabrications, layout, and erection details, including Through Plate Girder (TPG) Spans

(b) Steel Sheet Piles

(c) Shoring

(d) Bearings

(e) Reinforcing Steel Layout and Details

(f) Pumping Station components:

i) Metal Fabrications, layout and erection details

ii) Shoring and dewatering system required for excavations

iii) From details for suspended slabs

iv) Shoring for suspended support walls and grade beams

v) Monorail and hoist system

vi) Reinforcing Steel layout and details

vii) Pumping Station Superstructure components

(g) Handrails and Miscellaneous Metals

(h) "Welcome to Transcona" Signs

(i) Forcemain fittings

E3.2.4 Review Shop Drawings, product data and samples prior to submission and stamp and sign Shop Drawings indicating conformance to the Contract requirements.

E3.2.5 Schedule submittals at least fourteen (14) Calendar Days before dates reviewed submittals will be needed, and allow for a fourteen (14) Calendar Day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract.

E3.2.6 Submit five (5) paper prints of Shop Drawings. The Contract Administrator will retain three (3) copies of all submittals and return two (2) copies to the Contractor.

E3.2.7 Accompany submittals with transmittal letter containing:

(a) Date

(b) Project title and Bid Opportunity number

(c) Contractor's name and address

(d) Number of each Shop Drawing, product data and sample submitted

(e) Specification Section, Title, Number and Clause

(f) Drawing Number and Detail / Section Number

(g) Other pertinent data

E3.2.8 Submittals shall include:

(a) Date and revision dates.

(b) Project title and Bid Opportunity number.

(c) Name of:

i) Contractor

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 standards, such as CSA or CGSB numbers.

xi) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract.

E3.2.9 After Contract Administrator's review and return of copies, distribute copies to Subcontractors and others as appropriate.

E3.2.10 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.

E3.3 Other Considerations

E3.3.1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

E3.3.2 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.

E3.3.3 Incomplete Shop Drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

E3.3.4 No delay or cost claims will be allowed that arise because of delays in submissions, resubmissions and review of Shop Drawings.

E4. VERIFICATION OF WEIGHTS

E4.1 Further to clause 3.16.3 of CW 1130 no charge shall be made to the City for any delays or loss of production caused by inspection and verification.

E5. MOBILIZATION AND DEMOBILIZATION

DESCRIPTION

E5.1 General

E5.1.1 This Specification covers all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E5.1.2 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.

E5.2 Scope of Work

E5.2.1 The Work under this Specification shall include but not be limited to:

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

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

(c) Supplying and installing Type 1 secure fencing as per E5.6.3 around the site where noted in this Specification and as directed by the Contract Administrator.

(d) Maintaining and removing any access roadway;

(e) Traffic control (E11) and traffic management (E12); and

(f) Pedestrian protection/accommodation (E12).

MATERIALS

E5.3 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.

E5.4 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

E5.5.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E5.6 General

E5.6.1 Layout of On-Site Work Facilities

(a) The Contractor shall mobilize all on-site Work and other temporary facilities where noted on the Drawings or as directed by the Contract Administrator.

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

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 (Type 1)

(a) A minimum 2.4 m high chain-link secure fence around the site lay-down and Work site areas shall be installed prior to commencement of site activities.

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

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

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.

(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) 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.

MEASUREMENT AND PAYMENT

E5.7 Mobilization and Demobilization

E5.7.1 Mobilization and demobilization will not be measured. This Item of Work will be paid for at a percentage of the Contract Lump Sum Prices, 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. These percentages shall be as follows:

(a) When Contract Administrator is satisfied that construction has commenced 30%

(b) During construction 60%

(c) Upon Total Performance 10%

E6. OFFICE FACILITIES

E6.1 The Contractor in agreement with the City shall utilize a home at 1168 Plessis Road as office facilities, meeting the following requirements:

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

(b) Contractor shall supply four (4) parking stalls in a proximity to the field office.

(c) The office shall have a minimum floor area of 66 square metres, a height of 2.4 m with a minimum of four windows for cross ventilation and a door entrance with a suitable lock.

(d) Office shall be suitable for all weather use. It shall be equipped with a heater and air conditioner so that the room temperature can be maintained between either 16-18˚C. Gas service may be disconnected at which time an alternative heat source will need to be provided by the Contractor.

(e) The office shall be adequately lighted and have a minimum of five operating wall outlets.

(f) The office shall be equipped with internet hook up at five locations and one land line telephone.

(g) The office shall be furnished with five desks, one drafting table, 2 tables each 3m X 1.2m, one stool, one four drawer legal size locking filing cabinet, and a minimum of 12 chairs.

(h) The office shall be equipped with a water cooler and be constantly supplied so as never to run out.

(i) The operation of the existing toilet/toilets must be maintained.

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

E6.2 The Contractor shall be responsible for all insurance costs for the field office, contents, and the general maintenance of the office facilities.

E6.3 Should the home become unusable due to construction activities prior to the date of Total Performance, the Contractor shall supply an office facility meeting the above requirements including all operating costs.

E6.4 The office facilities shall be provided from the date of the commencement of the Work to the date of Total Performance.

E6.5 No separate measurement or payment will be made for “Office Facilities”.

E7. GEOTECHNICAL INSTRUMENTATION

E7.1 General Requirements

E7.1.1 Geotechnical instrumentation (by others) for the purpose of construction and post-construction performance monitoring is expected for the site as shown on the Drawings. The instrumentation of the site may include, but is not limited to, the installation of monitoring wells, vibrating wire piezometers, settlement gauges and slope inclinometers within the construction area.

E7.2 Monitoring

E7.2.1 The instrumentation will be monitored by the Contract Administrator during construction. Contractors are advised that it may be necessary to limit equipment movement in the vicinity of the monitoring work. The Contract Administrator will make every effort to

coordinate the monitoring with the Contractor's operation so as to minimize disruption of the Work.

E7.3 Protection of Instrumentation

E7.3.1 The Contractor shall take all necessary precautions to prevent damage to geotechnical instrumentation where shown on the Drawings. Should instrumentation become damaged as a result of the Contractor's operation, it shall be repaired or replaced, if necessary, at the Contractor's expense.

E7.4 Additional Instrumentation

E7.4.1 It may become necessary during the Work to install additional geotechnical instrumentation. The Contractor shall facilitate this work. The Contract Administrator will make every effort to coordinate the installation of additional instrumentation with the Contractor's operation so as to minimize disruption of the Work.

E8. TREE PROTECTION DURING CONSTRUCTION

E8.1 Construction activities near trees may result in injury to the trunk, limbs or roots of trees causing damage or death of the tree. In order to prevent such damage:

E8.1.1 Trees within or adjacent to a construction area must be protected during construction by means of a barrier surrounding a "Tree Protection Zone" (TPZ) as outlined in Sub Sections E8.2 and E8.3.

E8.1.2 Activities which are likely to injure or destroy the tree are not permitted within the TPZ.

E8.1.3 Tree pruning or root pruning of City of Winnipeg owned trees may only be done by a Contractor approved by the project's Qualified Tree Consultant (refer to E8.5) or Urban Forestry Branch.

E8.1.4 No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.

E8.1.5 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.

E8.2 Tree Protection Zone:

E8.2.1 The following is a chart showing optimal distances for determining a tree protection zone (the roots of a tree can extend from the trunk to approximately 2-3 times the distance of the drip line). 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 (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

E8.2.2 Diameter at breast height (DBH) measurement of tree trunk is taken at 1.4 metres above ground.

E8.2.3 Tree Protection Zone distances are to be measured from the outside edge of the tree base towards the drip line and may be limited by an existing paved surface, provided the existing paved surface remains intact throughout the construction work

E8.3 Tree Protection Barriers:

E8.3.1 Trees within tree protection zones shall be protected by means of a "tree protection barrier" meeting the following Specifications:

(a) The required barrier is a 1.2 metre high orange plastic web snow fencing on 50mm x 100mm frame or as directed by the City of Winnipeg Urban Forestry Branch in accordance with City of Winnipeg Protection of Existing Tree Specifications. The barrier can be lowered around branches lower than 1.2 metres. The barrier location can be adjusted to align with curbs and edges at clear path of travel zones.

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

(c) 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 the project. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place.

(d) 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. 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.

E8.4 Utility Construction, Engineering and Capital Construction Projects.

E8.4.1 It is recognized that there are cases where trees are growing overtop existing utilities or beside capital infrastructure. While the guidelines in this section still apply, in these cases some modification to Table 1 in addition to root pruning may be permitted provided non-open trench methods of construction are employed (as defined in CW2110 and CW2130).

E8.4.2 Root Pruning will be required to be done under the direction of, and along with, written sign-off by the Project's Qualified Tree Consultant (Refer to E8.5). The objective is to avoid severance of anchor roots, which provide upright support for trees and minimize damage to the tree.

E8.4.3 Above ground clearance for overhanging branches in the work zone must be anticipated. The utility or it's consultant is required to have a Forestry approved tree service raise the crown of all branches to provide adequate clearance for construction equipment.

E8.5 Qualified Tree Consultants

E8.5.1 An arborist certified by the International Society of Arboriculture (ISA) who has a diploma (minimum) in arboriculture or urban forestry; and

E8.5.2 A landscape architect who is a member in good standing of the Manitoba Association of Landscape Architects.

E8.6 No separate measurement or payment will be made for the protection of trees.

E9. TREE REMOVAL

E9.1 Further to CW 3010 - Clearing and Grubbing, tree removal including the roots shall be measured on a unit basis for the number of trees (larger than 75 mm in diameter) removed in accordance with CW 3010. Payment shall be at the Contract Unit Price bid for "Tree Removal" measured as specified herein for the total number of trees removed in accordance with this Specification, accepted and measured by the Contract Administrator.

E9.2 The Contractor shall identify trees that may be affected by Work and inform the Contract Administrator of trees that need to be removed. No trees shall be removed from the project without written approval from the Contract Administrator.

E10. SITE SECURITY

E10.1 During the project the Contractor shall be responsible for maintaining only authorized Site access 24 hours a day. Any existing security fencing, etc. that may be altered during construction will need to have an equivalent replacement. No separate measurement for payment shall be made for this work.

E11. TRAFFIC CONTROL

E11.1 Further to clauses 3.6 and 3.7 of CW 1130:

(a) Where directed, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.

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

E12. TRAFFIC MANAGEMENT

E12.1 Further to clause 3.7 of CW 1130:

E12.1.1 Plessis Road 200 m south of Kernaghan Avenue to Dugald Road will be closed to thru traffic and pedestrians from July 28, 2013, until December 30, 2014, completion of Critical Stage 3 as outlined in D25. The City of Winnipeg Traffic Services Department will barricade and sign the street "Road Closed" for the duration of the Project.

E12.1.2 Maintain a minimum of one lane of traffic eastbound and one lane westbound on Dugald Road during construction. The Contractor will be responsible for all signage related to the temporary closures and securing of his work and diversion of traffic around his work area.

E12.1.3 Left turns from eastbound Dugald Road to northbound Plessis Road will not be permitted. Eastbound to Northbound lefts will be permitted for construction vehicles with the use of a flagman. Left turns from westbound Dugald Road to southbound Plessis Road must be maintained at all times.

E12.1.4 Where left turn lanes exist, an additional lane to accommodate the left turn storage lane shall be maintained at all times.

E12.1.5 Maintain one lane of traffic in each direction on Plessis Road at all times throughout the project limits, except for the section described in E12.1.1 described above. Maintain left turns from Northbound Plessis Road to Westbound Dugald Road at all times.

E12.1.6 Intersecting street and private approach access south of Kernaghan Avenue to the CN Redditt Subdivision shall be maintained at all times.

E12.1.7 Should the Contractor be unable to maintain pedestrian or vehicular 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.

E12.1.8 Ambulance/emergency vehicle access on site must be maintained at all times.

E13. REFUSE AND RECYCLING COLLECTION

E13.1 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, prior to an established time, in accordance with E13.2 to permit the normal collection vehicles to collect the materials. Immediately following recycling collection the Contractor shall return recycling receptacles to the addresses marked on the receptacles.

E13.2 Collection Schedule:

Residential Collection North and South of Dugald Road.

Collection Day(s): **Thursdays (Zone 2) for both garbage and recycling**

Commercial South of Dugald.

Collection Day(s): **Wednesdays**

Commercial North of Dugald.

Collection Day(s): **No City Collection**

E13.3 No measurement or payment will be made for the work associated with this Specification.

E14. PEDESTRIAN SAFETY

E14.1 Pedestrian access is not permitted from Dugald Road to 200 m south of Kernaghan Avenue. The Contractor is responsible for all signage and restrictions of this operation. The Contractor shall be responsible for installing, supplying and maintaining the fence in proper working condition. No measurement for payment shall be made for this work.

E15. WATER OBTAINED FROM THE CITY

E15.1 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.

E16. SURFACE RESTORATIONS

E16.1 Further to clause 3.3 of CW 1130, at the end of Critical Stage 3 as defined in D25, 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.

E17. COORDINATION OF CONSTRUCTION WITH CN

DESCRIPTION

E17.1 General Requirements

E17.1.1 The Contractor shall be responsible to meet all Canadian National (CN), constraints, requirements, and safety measures.

E17.1.2 The Contractor shall be responsible for any damage, delay, disruption and/or inconvenience caused to CN by his equipment or operations of Work to the tracks, the railway's operation or their property.

E17.1.3 If any emergency occurs, CN can be contacted through its Emergency CN Police Line 1-800-465-9239.

E17.1.4 The Contractor shall follow the requirements of CN as stipulated in the CN Safety Requirements herein in this Bid Opportunity Appendix B. All employees of the Contractor shall obtain the CN Contractor Orientation Identification card and sticker prior to working on Site.

E17.1.5 The Contractor shall provide CN with a 24 hour phone number through which the Contractor can be contacted for emergency purposes.

E17.2 Temporary Construction Crossing Permit

E17.2.1 Should CN allow a temporary construction crossing, the Contractor shall be responsible for the application and payment for the temporary construction crossing permit. The Contractor together with the Contract Administrator will meet with the appropriate CN representative and determine the best location for the crossing. A detailed safety plan regarding vehicle and equipment crossing will need to be submitted with the permit.

E17.2.2 On a daily basis the designated Contractor's employee will discuss the days' equipment movement over the crossing with the protecting foreman.

E17.2.3 At the end of each working day the Contractor will be responsible to barricade the crossing to stop vehicle/equipment movements across the active rail lines.

E17.2.4 All costs, liabilities, cleaning up and restoring of Site after removal of the crossing will be the Contractor's responsibility.

E17.3 Contractor's Use of Site

E17.3.1 The Contractor shall confine storage of materials and the operations of equipment, workmen, and erection of trailers to the limits indicated on the Contract drawings.

E17.3.2 No materials shall be stored closer than 5 m of the nearest rail of any operated track. Material shall not be stockpiled higher than 1.5 m.

E17.3.3 All costs, liabilities, cleaning up and restoring of Site after completion of the project will be the Contractor's responsibility.

E17.4 Flag Protection of Work

E17.4.1 The Contractor will be required to supply flag protection for this project.

E17.4.2 Protecting foreman must have qualifications that meet CN requirements and are required to provide proof of such with a copy of record provided to the Contract Administrator prior to the start of any works. Payment for flag protection will be as outlined in E53.

E17.5 Signals and Communication Cables

E17.5.1 The Contractor shall request CN to locate their cables before commencement of any Work.

E17.5.2 The Contractor shall give CN 72 hour's notice to locate cables.

E17.5.3 The Contractor shall use extreme caution when working in the vicinity of any signal and communication cables.

E17.5.4 As a result of damage to any cable, fibre optic line or associated equipment by his operations, the Contractor shall be held responsible for all costs required to repair the cable, as well as the loss of all revenue incurred by CN.

E17.6 Barricades and Signage

E17.6.1 The Contractor shall observe all necessary precautions and provide, erect, and maintain suitable signs, barricades, and lights to protect all persons from injury and all vehicles from damage during the progress of the Work, all to the approval of the Contract Administrator or any authority having jurisdiction at this location.

E17.7 Down Time

E17.7.1 The Contractor shall anticipate down time each day for crane work or any equipment, such as drill rigs, that could fall on CN property. With 15 to 20 trains a day, passing adjacent to the project site, 140 to 200 minutes of down time within a 24-hour period is anticipated.

E18. ENCROACHMENT ON PRIVATE PROPERTY

E18.1 Further to Section 3.11 of CW 1130 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.

E18.2 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 building, fencing, trees and plants, and provision shall be made to maintain full drainage for private properties during construction.

E19. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

E19.1 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 the Work.

E19.2 Any damage cause by the Contractor or his Subcontractors to the adjacent structures or properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

E20. DEMOLITION AND REMOVALS

DESCRIPTION

E20.1 General

E20.1.1 This Specification covers all operations relating to "Demolition and Removals".

E20.1.2 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.

E20.1.3 The Work shall include, but is not limited to the following:

(a) Demolition and removal of existing structures.

(b) Removal of existing concrete foundations.

(c) Demolition and removal of existing light standard pile foundations. Light standards to be relocated as directed by the Contract Administrator.

(d) Protection of services to be maintained, demolition, disposal, and clean-up of Work Site in anticipation of new Work. Limits of the contract are as shown in Drawings.

E20.1.4 The area west of the proposed Pumping Station where the dry pond is to be located, formerly known as the City of Transcona reservoir and pump house site. The buildings which include the reservoir, pump house, and valve pit and chamber, have since been removed although some of the foundations still exist below grade. It is anticipated the Contractor may encounter further foundations within the contract limits. These foundations will be required to be removed to a minimum of 1.0m below excavation grade within the contract limits.

E20.2 References

E20.2.1 Removals are in accordance with Standard Construction Specifications:

(a) CW 1110 - General Instructions

(b) CW 1120 – Existing Services, Utilities, and Structures.

(c) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs

(d) CW 3240 – Renewal of Existing Curbs

E20.2.2 The National Building Code of Canada 2010 Volume 2, Part 8 – Safety Measures at Construction and Demolition Sites

E20.2.3 Manitoba Workplace Safety and Health Act, and all applicable National, Provincial, and Municipal regulations.

CONSTRUCTION METHODS

E20.3 Protection

E20.3.1 Prevent movement, settlement or damage of adjacent structures. Make good damage caused by demolition.

E20.4 Execution

E20.4.1 Inspection

(a) Inspect Site with Contract Administrator and verify extent and location of items designated for removal, disposal, salvage and items to remain.

(b) Locate and protect utilities.

(c) Notify and obtain approval of Contract Administrator before starting demolition.

E20.4.2 Preparation

(a) Do not disrupt active or energized utilities.

E20.4.3 Safety Code and Requirements

(a) Unless otherwise specified, carry out demolition Work in accordance with the City of Winnipeg Safety Directives and Guidelines.

(b) Blasting operations shall not be permitted during demolition unless reviewed and approved by the Contract Administrator.

E20.4.4 Demolition

(a) Demolish structures to permit construction of new Work as indicated.

(b) At end of each day's Work, leave Work in safe condition so that no part is in danger of toppling or failing.

(c) Do not sell or burn materials on Site.

E20.4.5 Disposal of Demolished Material

(a) The Contractor shall be responsible for removal of debris and waste from the Work area to the location to an appropriate solid waste disposal area approved by the Contract Administrator.

(b) Metal debris, which may include structural steel, miscellaneous inserts, and reinforcing steel, shall be removed from the Site and Disposed of by the Contractor.

MEASUREMENT AND PAYMENT

E20.5 Demolition and Removals

E20.5.1 Foundation Removal will be measured on a volume basis and paid for at the Contract Unit Price per cubic 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, accepted and measured by the Contract Administrator.

(a) Items of Work

i) Removals

- Abandoned Reservoir Foundation
- Abandoned Pump House Foundation
- Abandoned Valve Pit/Chamber Foundation

E20.5.2 The Demolition and Removal of the houses will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the “Demolition and Removals”, 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.

E20.5.3 No payment shall be made for demolition beyond the limits specified, or those otherwise approved by the Contract Administrator. The separation, as necessary of embedded and structural steel shall be considered incidental to the Work. Removal of construction debris shall be considered incidental to the Work.

BRIDGE / RETAINING WALLS

E21. HYDRO EXCAVATION

DESCRIPTION

E21.1 General

E21.1.1 This Specification covers all operations relating to the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the recovery of evacuated material by vacuum type means or equivalent method as approved by the Contract Administrator.

E21.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E21.2 Equipment

E21.2.1 Hydro excavation unit shall be capable of maintaining a minimum working pressure of 10,000 psi, at a rate of flow of 10 to 12 gallons per minute. The unit should be adjustable, so as to provide adequate pressure to remove earthen material identified by the Contract Administrator.

E21.2.2 Spray head shall be equipped with a rotating type nozzle, in order to provide a wider path of cut.

CONSTRUCTION METHODS

E21.3 Hydro-Removal of Earthen Material

E21.3.1 Earthen material adjacent to utility entity shall be sprayed with high pressure water so as to remove all such material identified by the Contract Administrator.

E21.4 Recovery of Excavated Material

E21.4.1 The recovery of excavated material shall be done using vacuum type method, or other type method as approved by the Contract Administrator.

E21.4.2 The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filling with excavated material.

E21.4.3 The use of mechanical sweepers will not be allowed.

E21.4.4 Dispose of material in accordance with Section 3.4 of CW 1130.

E21.5 Backfill of Hydro Excavated Hole

E21.5.1 The Contractor shall be responsible for the backfill of the hydro excavated hole with flowable cement-stabilized fill or sand backfill upon completion of the work described herein, to the approval of the Contract Administrator.

MEASUREMENT AND PAYMENT

E21.6 Hydro Excavation

E21.6.1 Hydro excavation of earthen material will be measured on a time basis and paid for at the Contract Unit Price per hour for “Hydro Excavation”, 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. Travel to and from the site will not be included for payment.

E21.7 Backfill

E21.7.1 Cement-Stabilized fill or sand backfill is considered incidental to Hydro Excavation and no separate measurement or payment will be made.

E22. SUBDRAIN SYSTEMS

DESCRIPTION

E22.1 General

E22.1.1 This Specification covers all operations relating to the supply and installation of the subdrain pipe and wall drain systems located on the superstructure deck, at each abutment, and in front of and behind retaining walls, including leads and connections to catch basins.

E22.1.2 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.

MATERIAL

E22.2 General

E22.2.1 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.

E22.3 Drain Pipes, Fittings, and Accessories

E22.3.1 Perforated and non-perforated drain pipes, fittings, and other accessories and appurtenances for the superstructure deck and abutment substructure drain pipe system, shall conform to the requirements of the City of Winnipeg Standard Construction Specification CW 3610-R3 and requirements CSA G401-07, for Corrugated Steel Pipe

(CSP). Corrugated steel drain pipe shall be perforated and non-perforated, aluminized Type 2, 1.6 mm gauge, with the diameter as shown on the Contract drawings.

E22.3.2 Perforated and non-perforated drain pipes, fittings, and other accessories and appurtenances for the retaining wall drain pipe system shall be 150 mm diameter gasketed bell and spigot High Density Polyethylene (HDPE) Type SP pipe with Class 2 perforations in accordance with AASHTO M252-07 and CW3120-R4.

E22.3.3 All other drain pipes, fittings, and other accessories and appurtenances shall conform to the requirement of Standard Construction Specification CW 2130 and CW3120-R4.

E22.4 Drainage Fabric

E22.4.1 Drainage fabric shall be in accordance with CW3120-R4 or as accepted by the Contract Administrator in accordance with B8.

E22.5 Drainage Material

E22.5.1 Drainage material shall be in accordance with Specification CW 3120-R4.

E22.6 Equipment

E22.6.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E22.7 Subdrain Systems

E22.7.1 Install a perforated drain pipe system on the super structure deck, in front of and behind retaining walls, and at each abutment in accordance with CW 3120-R4. The supply and installation of this drain pipe system shall include the drain pipe, connections, all required fittings, drain pipe backfill materials, and the drainage fabric.

E22.7.2 The drain pipe shall be laid to the line and grade shown on the Contract drawings or as directed by the Contract Administrator with the separate sections securely jointed together by means of tightly drawn coupling bands.

E22.7.3 Subdrain Systems in front of the retaining walls must be completely installed and backfilled within two weeks of the initial excavation for the subdrain systems.

MEASUREMENT AND PAYMENT

E22.8 Subdrain Systems

E22.8.1 The Subdrain Systems will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the “Excavation and Backfill”, 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.

E23. EXCAVATION AND BACKFILL

DESCRIPTION

E23.1 This Specification covers all operations relating to the following:

E23.1.1 Excavation and backfilling required to construct the retaining walls, pier, and abutments. Backfilling required to construct the Pumping Station.

E23.1.2 Supply and installation of perforated and non-perforated subdrain pipe and wall drain systems on the superstructure deck, at each abutment, and in front of and behind retaining walls including leads and connections to catchbasins.

E23.1.3 The supply and installation of vertical drains behind the lower sheetpile retaining walls.

E23.2 The Works also include the following items, which are incidental to the Work.

E23.2.1 Preparation of the base of excavations.

E23.2.2 The design, fabrication, erection, and removal of all temporary shoring, and such temporary protective measures as may be required to construct the Works.

E23.2.3 The off-site disposal of surplus and unsuitable material.

E23.2.4 Dewatering and or precipitation removal of the excavations as may be required for construction of the structures in the dry.

E23.3 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.

MATERIALS

E23.4 General

E23.4.1 Protection

(a) The Contractor shall provide protection to ensure no damage to existing facilities and equipment, including railway infrastructure, utilities, and oil lines.

E23.4.2 Excavation

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

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

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

E23.4.3 Backfilling

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

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

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

(d) All granular backfill for the Bridge, Retaining Walls and Pumping Station, including levelling base fill shall be clean and free from organic material and in accordance with CW 2030-R7.

(e) All granular backfill for the Bridge and Retaining Walls shall be Type 1 Material in accordance with 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

(f) All granular backfill for the Pumping Station shall be Type 2 Material in accordance with CW 2030.

(g) All granular backfill for the Active Transportation Paths and Walkways shall be Type 3 Material in accordance with CW 2030.

(h) Clay backfill for structures shall be preferably native of a type accepted by the Contract Administrator.

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

E23.5 Submittals

E23.5.1 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any excavations on the Site, detailed design calculations and Shop Drawings for all shoring that is signed, sealed, and dated by a Professional Engineer experienced in shoring design and licensed to practice in the Province of Manitoba in accordance with E3 Shop Drawings.

E23.6 Equipment

E23.6.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E23.7 Excavation

E23.7.1 Excavations shall be completed to the elevations required to construct the Works or to such other elevations as may be directed by the Contract Administrator in the field. Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of the excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

E23.7.2 All material shall be brought to the surface by approved method, suitable fill material placed on site where required as approved by the Contract Administrator or disposed of away from the site.

E23.7.3 After each excavation is completed, the Contractor shall notify the Contract Administrator.

E23.7.4 The Contractor shall excavate only material that is necessary for the expeditious construction of the structure or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of runways, existing stock piling, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at his own expense and as directed by the Contract Administrator.

E23.7.5 All excess excavated material shall become the property of the Contractor and shall be removed from the site.

E23.7.6 Following installation of the vertical drains behind the lower sheetpile retaining wall and installation of the drain holes in the steel sheetpiles, any existing native material between the drain hole and the vertical drains shall be replaced with Type 1 granular backfill.

E23.7.7 The vertical drains behind the lower retaining walls, drain holes, subdrains in front of the lower retaining walls, granular backfill for roadway shoulder construction, and the insulation in front of the lower retaining walls shall be installed in the same construction season as, and immediately following, the excavation in front of the lower sheetpile retaining walls.

E23.8 Backfilling

E23.8.1 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.

E23.8.2 All backfill material shall be supplied, placed, and compacted in lifts of 150 mm (maximum) to a minimum of 95% of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time.

E23.8.3 The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

E23.8.4 The Standard Proctor Density for granular and clay backfill material shall be determined at the optimum moisture content in accordance with standard laboratory Proctor Compaction Test Procedure.

E23.8.5 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.

E23.8.6 The frequency and number of tests to be made shall be as determined by the Contract Administrator.

E23.8.7 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.

E23.8.8 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.

E23.8.9 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.

MEASUREMENT AND PAYMENT

E23.9 Excavation and Backfill

E23.9.1 The excavation, backfilling, subdrain systems, and vertical drains required for the construction of retaining walls, pier, and abutments will not be measured. They will be paid for at the Contract Lump Sum Price for “Excavation and Backfilling”, which price will be payment in full for supplying all materials/equipment and performing all operation herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E24. ROCK-SOCKETED CAISSONS

DESCRIPTION

E24.1 General

E24.1.1 This Specification covers all operations relating to the supply and installation of rock-socketed caissons for the abutments, pier, and Pumping Station including but not limited to overburden drilling, rock coring, water control, supply and installation of steel casings, supply and placement of concrete and reinforcing steel, removal of temporary steel casings and disposal of excavated material.

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

E24.1.3 All Works within the CN Right of Way or where construction equipment and materials may be at risk of entering the Right of Way must be coordinated and performed as outlined in E17 Coordination of Construction with CN.

E24.2 Definitions

E24.2.1 Overburden: All material encountered above the bedrock including imported fill and native soils.

E24.2.2 Weathered Rock Zone: Weathered rock encountered above the sound bedrock including voids and soil filled cavities which would require permanent steel casing to support the caisson hole.

E24.2.3 Sound Rock: Rock which may contain fractures but a casing is not required to support the caisson hole.

E24.3 Provisional Pay Items

E24.3.1 Base tender Lump Sum Price on number of caissons shown on the Drawings including all labour and material required to install rock-socketed caissons to Elevations as per Contract Drawings.

E24.3.2 Provide unit price for additional length of rock-socket into sound bedrock, including coring, rock removal, reinforcing and concrete.

E24.3.3 Provide unit price for additional length of the steel casing only into weathered rock zone.

E24.3.4 Provide unit price for subtracted length of rock socket into bedrock, including a reduction of coring, rock removal, reinforcing and concrete to be credited to the City.

E24.4 Elevations on Drawings

E24.4.1 The caisson elevations shown on the Drawings are approximate only. Refer to the test hole logs and all other available information to gain more knowledge about the surface and subsurface conditions.

MATERIALS

E24.5 General

E24.5.1 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.

E24.6 Handling and Storage

E24.6.1 Storage of materials shall be in accordance with CSA Standard CAN/CSA A23.1-09. Materials damaged by careless or negligent handling or storage by the Contractor shall be replaced at the Contractor's expense.

E24.7 Testing

E24.7.1 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.

E24.7.2 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 his own expense.

E24.8 Steel Casings

E24.8.1 Steel casings shall be as follows:

(a) 1219 mm diameter x 12.5 mm thick permanent casing as indicated on the drawings, conforming to CSA G 40.21, Grade 300W. For pier caissons, steel casings shall be hot dip galvanized for the top 6.5 metres of pile length.

(b) Splicing of the steel casings shall be with full penetration welds. Welding, welder qualifications, pre-qualification of weld details and inspection of the welds shall conform to the requirements of the ANSI/AASHTO/AWS Bridge Welding Code D1.5 and CSAW-59 (latest editions).

(c) Galvanizing shall be in accordance with ASTM A123/A123M and painted with polyurethane paint to match concrete color.

E24.9 Concrete

E24.9.1 The concrete shall conform to E25.

E24.9.2 The concrete shall be placed by the tremie method.

E24.10 Reinforcing Steel

E24.10.1 The reinforcing steel shall conform to Section E26 of this Specification.

E24.11 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.

E24.12 Equipment

E24.12.1 All equipment shall be of a type accepted by the Contract Administrator and shall be kept in good working order.

(a) Tremie Equipment

i) The tremie pipe shall consist of a tube, having a diameter of not less than 250mm, 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.

CONSTRUCTION METHODS

E24.13 Location and Alignment of Caissons

E24.13.1 The Caissons shall be installed in the positions shown on the Drawings or as directed by the Contract Administrator. The Contractor will be required to remove obstructions in order to achieve the proper alignment.

E24.13.2 Alignment shall not deviate more than 2 percent of caisson length out of plumb and not more than 75 mm off centre at the top of caisson.

E24.14 Cut-off of Steel Casings

E24.14.1 The casings shall be set to the elevations shown on the Drawings. All costs associated with the casing cut-offs shall be incidental to the work.

E24.15 Rock-Socketed Caisson Installation

E24.15.1 The Contractor shall install shaft holes and permanent steel casings to diameters indicated on the Drawings at each caisson location. The steel casings shall be advanced into bedrock to the depth indicated on the Drawings or as determined by the Contract Administrator.

E24.15.2 The Contractor may determine that temporary steel casings are required in addition to the permanent casings shown on the Drawings.

E24.15.3 The Contractor shall install rock sockets using core barrels to diameters indicated on drawings. The sockets shall be advanced into sound bedrock to the depth indicated on drawings or as determined by the Contract Administrator. Ensure loose material is removed and the caisson is free of foreign material. Any water or material removed from the caisson holes shall be collected and removed from site.

E24.15.4 Following the excavation of the rock sockets to the required depth, the Contractor is required to provide evidence to the Contract Administrator that the socket is in an acceptable condition. A remote television inspection with video link to the surface or other similar inspection means will be required to demonstrate that the specified condition of the completed sockets have been met, to the satisfaction of the Contract Administrator.

E24.15.5 The inspection shall consist of the following. Inspection shall be performed in each rock socket with the Contract Administrator and Contractor present. The inspection shall be capable of showing all vertical and bottom faces of the rock socket. If, following the inspection by an approved method, in the opinion of the Contract Administrator the rock socket for any given caisson has not penetrated a continuous section of sound bedrock of the depth and quality suitable for rock socket installation, the Contractor will be required to extend the length of the socket until this condition is satisfied or as directed by the Contract Administrator.

E24.15.6 If the rock socket is found to have loose material or foreign matter inside, the material shall be removed by the Contractor to the satisfaction of the Contract Administrator. Additional inspections will be required following cleaning operations or further drilling of the rock sockets as directed by the Contract Administrator.

E24.15.7 The Contractor shall maintain accurate records of the bedrock strata elevation, tip elevations, casing depth, and socket length for each caisson. At the completion of these works, three (3) copies are to be submitted to the Contract Administrator.

E24.15.8 The Contract Administrator may require extension of the steel casings into bedrock and extension of the rock sockets if, in the opinion of the Contract Administrator, it is necessary in order to reach an acceptable quality of sound bedrock. The Contract Administrator may also reduce the length of rock sockets at the time of installation based on the quality of rock as determined by the Contract Administrator.

E24.15.9 Upon acceptance of the caisson hole by the Contract Administrator the Contractor shall place the reinforcing steel as indicated on the Drawings and fill the entire length of the caissons with tremie concrete to the top of caisson elevation.

E24.15.10 All costs associated with televised inspection at each rock socket location shall be incidental to the work.

E24.15.11 Supply, installation and removal of temporary steel casings if required for installation of caissons are incidental to the work.

E24.16 Tremie Concrete Procedure

E24.16.1 Where tremie concrete is to be used, sufficient additional cement shall be added to the mix to compensate for dilution due to the depositing of concrete in the water.

E24.16.2 Tremie concrete shall be deposited in a manner accepted by the Contract Administrator. Tremie concrete shall not be placed without the Contract Administrator's approval.

E24.16.3 To prevent segregation, concrete deposited underwater shall be carefully deposited in a compact mass in its final position by means of a tremie pipe, or other approved method, and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit. The water level shall be regulated so that there is no fluctuation of water pressure that may be injurious to the concrete.

E24.16.4 The minimum rate of depositing tremie concrete shall be 15 m3/hr. Continuous soundings shall be taken during the concrete pour and all irregularities in the concrete profile shall be corrected. If a tremie pipe is used, it shall be supported so as to permit:

(a) Free movement of the discharge end over the entire top surface of the work.

(b) Rapid lowering when necessary to retard or stop the flow of concrete.

E24.16.5 The discharge end shall be closed at the start of the Work in order to prevent water from entering the tube and it shall be sealed at all times when not within the deposited concrete.

E24.16.6 The tremie tube shall be kept full up to the bottom of the hopper. When a batch is dumped into the hopper, the flow of concrete shall be induced by slightly raising the discharge end, always keeping it within the deposited concrete.

E24.16.7 Where tremie concrete is used, in addition to the heating and hoarding requirements in E25, the Contractor shall heat the water inside the caisson shaft to a minimum temperature of 5°C, and shall maintain the water above the deposited concrete at this temperature for a period of at least 7 days.

E24.17 Heating and Hoarding

E24.17.1 The Contractor shall make provisions for heating the concrete, in accordance with E25.54. All costs associated with heating and hoarding shall be incidental to the Contract Unit Price for "Supply and Install Rock-Socketed Caissons".

MEASUREMENT AND PAYMENT

E24.18 Supply and Install Rock-Socketed Caissons

E24.18.1 Supply and install rock-socketed caissons will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Supply and Install Rock-Socketed Caissons", 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.

E24.19 Added Length of Rock-Socket

E24.19.1 Added length of rock-socket shall be measured on a length basis and paid for at the Contract Unit Price per linear metre for "Added Length of Rock-Socket", 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.

E24.20 Added Length of the Steel Casing into Weathered Rock Zone

E24.20.1 Added length of the steel casing into weathered rock zone shall be measured on a length basis and paid at the Contract Unit Price per linear metre for "Added Length of the Steel

Casing into Weathered Rock Zone", 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.

E24.21 Subtracted Length of Rock-Socketed Caisson

E24.21.1 A subtracted length of rock-socketed caisson shall be measured on a length basis and payment will be credited to the City at the Contract Unit Price per linear metre for "Subtracted Length of Rock-Socketed Caisson" 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.

E25. STRUCTURAL CONCRETE

DESCRIPTION

E25.1 General

E25.1.1 This Specification covers 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.

E25.1.2 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.

E25.2 Scope of Work

E25.2.1 Supplying and placing structural concrete for abutment, backwall, and wingwalls;

E25.2.2 Supplying and placing structural concrete for pier cap;

E25.2.3 Supplying and placing structural concrete for shoulder and median traffic barriers and median slabs;

E25.2.4 Supplying and placing structural concrete for sidewalk and ATP slabs;

E25.2.5 Supplying and placing structural concrete for retaining wall cladding; and mock-up panels;

E25.2.6 Supplying and placing structural concrete for retaining wall caps;

E25.2.7 Supplying and placing structural concrete for Pumping Station; and

E25.2.8 Supplying and placing masonry fill.

E25.3 Submittals

E25.3.1 General

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

E25.3.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies,

chute, or pump) and 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;

viii) Quantity of other admixtures;

ix) Certification that all concrete constituents are compatible; and

x) Certification that the concrete mix(es) will meet the specified concrete performance criteria requirements.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.

(d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance to CSA A23.1-09 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.

E25.3.3 Concrete Mix Design Test Data

(a) Concrete

i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 16, Fibre Reinforced Structures, Clause 16.6.

iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the

delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) Aggregates

i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.

iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

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

vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.

vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

(c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E25.3.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

E25.3.5 Temporary False Work, Formwork and Shoring Works

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(b) Design Requirements

i) 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 CSA S269.1, “False Work for Construction Purposes.” The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

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 CSA Standard CAN/CSA S269.3-M92. All proposed fastening methods to the existing Pumping Station substructure must be submitted to the Contract Administrator for review and approval.

iv) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.

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 chamber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

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.

E25.3.6 Mock-up Panels

(a) Provide up to 3 concrete mock-up panels for approval of finish by the Contract Administrator prior to construction of the retaining wall cladding. Panels shall consist of 1200mm high x 4250mm long x 150mm thick, and include the architectural form liner pattern and form panel with the permeable formwork liner. Panels to be braced at all times to prevent toppling.

(b) Mock-ups to be constructed at the construction site at a location as directed by the Contract Administrator.

MATERIALS

E25.4 General

E25.4.1 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.

E25.4.2 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.

E25.5 Handling and Storage of Materials

E25.5.1 Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-09.

E25.6 Concrete

E25.6.1 Concrete materials susceptible to frost damage shall be protected from freezing.

E25.6.2 Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table E25.1.

TABLE E25.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	**Caissons**	**35 @ 56 Days**	**S-1**	**2**	**20 mm**	**-**	**-**
Type 2	**Abutments**	**35 @ 28 Days**	**C-1, S-1**	**1**	**20 mm**	**-**	**-**
Type 3	**Pier Caps,**	**35 @ 28 Days**	**C-1**	**1**	**20 mm**	**-**	**-**
Type 4	**Sidewalk / ATP Slabs, Retaining Wall Caps/Cladding, Shoulders and Median Traffic Barriers**	**35 @ 28 Days**	**C-1**	**1**	**20 mm**	**Corrosion Inhibitor and Synthetic Fibres**	**0.15**
Type 5	**Structural Concrete for Pumping Station**	**35 @ 28 Days**	**C1, S1**	**1**	**20 mm**	**-**	**0.15**

Type 6	**Masonry Fill**	**20 @ 28 Days**	**N**	**-**	**10mm**	**Max Slump 150mm**	**-**

E25.7 Working Base Concrete

E25.7.1 Working base concrete shall be placed in the locations as shown on the Drawings.

E25.8 Aggregates

E25.8.1 General

(a) 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.

(b) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A-09. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-09 or CSA A23.2-25A-09 is required.

(c) 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.

E25.8.2 Fine Aggregate

(a) Fine aggregate shall meet the grading requirements of CSA A23.1-09, 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.

(b) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-09, Table 12.

E25.8.3 Coarse Aggregate - Standard

(a) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-09, 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%.

(b) 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.

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

(d) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-09, Table 12, for concrete exposed to freezing and thawing.

E25.9 Admixtures

E25.9.1 Air-entraining admixtures shall conform to the requirements of ASTM C260.

E25.9.2 Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

E25.9.3 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.

E25.10 Cementitious Materials

E25.10.1 Cementitious materials shall conform to the requirements of CSA-A3001 and shall be free from lumps. Normal portland cement types GU or GUb, or sulfate resistant types HS or HSb shall be supplied unless otherwise specified on the Drawings.

E25.10.2 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.

E25.10.3 Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C1 or F and the substitution shall not exceed 30% by mass of cement.

E25.10.4 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.

E25.11 Water

E25.11.1 Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1-09 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.

E25.12 Corrosion Inhibitor

E25.12.1 Corrosion inhibitor shall be MCI 2005 NS, or equal as approved by the Contract Administrator, in accordance with B8. Dosage shall be 1 L/m3.

E25.13 Synthetic Fibres

E25.13.1 The synthetic fibres shall consist of 100% virgin polypropylene or 100 % virgin polyolefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance to the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6 except the post-cracking residual strength index (Ri) shall be determined in accordance with ASTM C1609.

E25.14 Formwork

E25.14.1 Formwork materials shall conform to CSA Standard A23.1-09, and American Concrete Publication SP4, “Formwork for Concrete.”

E25.14.2 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 O121-08, a minimum of 20 mm thick.

E25.14.3 Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-08. Approved Manufacturers are “Evans” and “C-Z.”

E25.14.4 Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

E25.14.5 No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

E25.14.6 Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

E25.14.7 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.

E25.14.8 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.

E25.14.9 Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E25.15 Form Coating

E25.15.1 Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal as approved by the Contract Administrator, in accordance with B8.

E25.16 Permeable Formwork Liner

E25.16.1 Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B8. This formwork liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.

E25.16.2 Paper-lined forms shall be used on all soffit surfaces, such as deck slab overhangs. The Contractor shall provide conclusive evidence that the paper-lined form proposed for use will not stain or otherwise blemish the hardened concrete surface.

E25.17 Architectural Formwork Liner

E25.17.1 The Contractor shall supply and install the architectural concrete finish formwork liner for use at the locations as shown on the Drawings in accordance with the Manufacturer's recommended procedures. Approved products are #154 (½" sine wave) by Scott Systems.

E25.18 Curing Compound

E25.18.1 Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.

E25.18.2 Curing compound for approach slabs and slope paving shall be resin-based and white-pigmented.

E25.18.3 Curing Compound shall be WR Meadows 1215 WHITE Pigmented, or equal as accepted by the Contract Administrator, in accordance with B8.

E25.19 Curing Blankets

E25.19.1 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 B8.

E25.20 Bonding Agents

E25.20.1 Latex Bonding Agent

(a) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B8. 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 ago.

E25.20.2 Bonding Grout

(a) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:

i) 1 part water;

ii) 1 part latex bonding agent; and

iii) 1½ parts Type GUSF Portland cement.

(b) 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.

E25.21 Epoxy Adhesive

E25.21.1 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 B8.

E25.22 Epoxy Grout

E25.22.1 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 B8.

E25.23 Cementitious Grout

E25.23.1 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 B8. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E25.24 Patching Mortar

E25.24.1 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.

E25.25 Flexible Joint Sealant

E25.25.1 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 B8.

E25.26 Fibre Joint Filler

E25.26.1 Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751-99 or equal as accepted by the Contract Administrator, in accordance with B8.

E25.27 Precompressed Foam Joint Filler

E25.27.1 Precompressed expanding filler shall be compressed to 20% of its expanded width and be a polyurethane foam, impregnated throughout with a latex modified asphalt. Approved products are “Emseal” by Emseal Corporation. Manufacturer’s recommended primer and top coat are to be used.

E25.28 Low Density Styrofoam

E25.28.1 Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B8.

E25.29 Backup Rod

E25.29.1 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%.

E25.30 Screed Bases and Chairs

E25.30.1 Screed bases shall be Hilti HAS 304 stainless steel threaded rods, or equal as accepted by the Contract Administrator, in accordance with B8.

E25.30.2 Screed chairs shall be Mega Screed as supplied by Brock White Canada Company, or equal as accepted by the Contract Administrator, in accordance with B8.

E25.31 Galvanized Dowels and Galvanized Expansion Sleeves

E25.31.1 Dowels and expansion sleeves shall be fabricated in accordance with CSA Standard CAN/CSA-G30.18-09.

E25.31.2 The dowels shall be galvanized in accordance with ASTM A123/A123M, to a minimum net retention of 610 g/m2.

E25.32 Miscellaneous Materials

E25.32.1 Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B8.

E25.33 Benchmark Plugs

E25.33.1 Benchmark plugs shall be supplied by the City. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be determined by the Contract Administrator.

E25.34 Equipment

E25.34.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E25.35 Vibrators

E25.35.1 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.

E25.35.2 The Contractor shall have standby vibrators available at all times during the pour.

MATERIALS

E25.36 General

E25.36.1 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.

E25.36.2 All materials shall conform to CSA Standard A23.1-09.

E25.36.3 All testing of materials shall conform to CSA Standard A23.2-09.

E25.36.4 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.

E25.37 Quality Assurance and Quality Control

E25.37.1 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.

E25.37.2 The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

E25.37.3 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.

E25.37.4 Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

E25.37.5 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.

E25.37.6 The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-09. An outline of the quality tests is indicated below.

E25.38 Concrete Testing

E25.38.1 Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-09, "Slump of Concrete". If the measured slump falls outside the limits described in E25.3.2, 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.

E25.38.2 Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-09, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E25.3.2, 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.

E25.38.3 The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-09, 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.

E25.38.4 Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202.

E25.38.5 Testing for post-cracking residual strength index of FRC shall performed in accordance with ASTM C1609.

E25.38.6 Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-09, "Sampling Plastic Concrete".

E25.38.7 Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-09, "Making and Curing Concrete Compression and Flexure Test Specimens".

E25.38.8 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-09, "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.

E25.38.9 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 E25.1 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-09, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E25.39 Corrective Action

E25.39.1 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.

CONSTRUCTION METHODS

E25.40 General

E25.40.1 It is intended that this Section cover all construction Work associated with Structural Concreting operations.

E25.40.2 Rate of application shall be the rate required to meet the requirements of ASTM C309-11 for the texture of concrete the curing compound is being applied to.

E25.41 Temporary False Work, Formwork, and Shoring

E25.41.1 Construction Requirements

(a) The Contractor shall construct false work, formwork and shoring strictly in accordance with the accepted Shop Drawings.

(b) All forms shall be of wood, metal or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the superstructure.

(c) 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.

(d) 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.

(e) 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.

(f) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

(h) 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.

(i) 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.

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

(k) 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.

(l) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.

E25.41.2 Form panels shall be constructed so that the contact edges are kept flush and aligned.

E25.41.3 Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.

E25.41.4 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.

E25.41.5 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.

E25.41.6 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.

E25.41.7 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.

E25.41.8 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.

E25.41.9 Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after 48 hours for the Contract Administrator to judge the type of surface produced.

E25.41.10 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.

E25.42 Concrete Construction Joints

E25.42.1 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.

E25.42.2 Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

E25.42.3 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.

E25.42.4 Refer to, E25.48 for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E25.43 Permeable Formwork Liner

E25.43.1 Permeable formwork liner shall be used on all exposed formed surfaces, except on soffit surfaces, Pumping Station walls, or surfaces where a normal or an architectural form finish is specified.

E25.43.2 The permeable formwork liner shall be used for only one (1) application.

E25.43.3 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.

E25.44 Architectural Formwork Liner

E25.44.1 Architectural formwork liner shall be used at locations shown on the Drawings.

E25.44.2 The architectural formwork liner shall be replaced after each use unless specifically allowed to be reused by the Manufacturer, as approved by the Contract Administrator.

E25.44.3 The supply, setup, installation, and removal of architectural formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E25.45 Benchmarks

E25.45.1 The Contractor shall install benchmark plugs supplied by the City at such locations on the structure as may be directed by the Contract Administrator.

E25.46 Structure Identification Date

E25.46.1 The Contractor shall indent into the exposed concrete a structure identification date at such location at the bridge abutments as shown on the Drawings, in accordance with the detail shown on the Drawings, or as otherwise directed by the Contract Administrator.

E25.47 Supply of Structural Concrete

E25.47.1 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.

E25.47.2 All mixing of concrete must meet the provisions of CSA A23.1-09, Clause 5.2, Production of Concrete.

E25.47.3 Time of Hauling

(a) 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.

(b) 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.

(c) 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.

(d) Unless otherwise noted in Table E25.1, “Requirements for Hardened Concrete”, no retarders shall be used.

(e) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-09 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.

(f) 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.

E25.47.4 Delivery of Concrete

(a) 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.

E25.47.5 Concrete Placement Schedule

(a) 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

(b) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E25.48 Preparation for Concreting Against Hardened Concrete

E25.48.1 All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:

(a) 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.

(b) 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.

(c) 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.

E25.49 Placing Structural Concrete

E25.49.1 General

(a) 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.

E25.49.2 Placing Structural Concrete

(a) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.

(b) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.

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

(d) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.

(e) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(f) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or “cold joints” within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.

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

(h) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.

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

(j) 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.

(k) 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.

E25.50 Finishing of Concrete Surfaces

E25.50.1 Finishing Operations for Unformed Surfaces

(a) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.

E25.50.2 Type 1 Finish – Exposed Formed Surfaces

(a) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes, but excluding soffit surfaces, Pumping Station walls, and where an architectural form finish is specified.

(b) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

(c) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.

(d) The surfaces shall be patched as specified in this Specification.

E25.50.3 Type 2 Finish – Unformed Surfaces

(a) All unformed concrete surfaces, shall be finished as outlined hereinafter.

(b) 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.

(c) 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.

(d) 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.

(e) The top surface of the sidewalk slab, bridge, backwall adjacent to trainman’s walkway, access slab to the Pumping Station, and intermediate floor slab in the Pumping Station shall be given a broom finish. Upon completion of finishing operations, and when excessive moisture has evaporated, the plastic surface of the concrete shall be given a textured finish by means of broom finishing with a steel or fibre broom of a type accepted by the Contract Administrator at right angles to the direction of traffic. Surface depressions introduced by the broom strands in the brooming operations shall not bae more than 3 mm deep.

E25.50.4 Type 3 Finish - Surfaces Below Finished Grade

(a) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of E25.20.2, E25.24, and E25.53.

(b) All surfaces below 300 mm below finish grade shall receive dampproofing.

E25.50.5 Working Base Concrete Finish

(a) During placing, concrete working base shall be vibrated, screeded and floated.

(b) 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.

E25.51 General Curing Requirements

E25.51.1 Refer to E25.50 for cold weather curing requirements and E25.56 for hot weather curing requirements.

E25.51.2 The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, an asphalt overlay, or coating.

E25.51.3 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.

E25.51.4 Curing compound shall be applied at the rate required by ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

E25.51.5 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.

E25.51.6 Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3ºC in one hour or 20ºC in 24 hours.

E25.51.7 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.

E25.51.8 Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces.

E25.51.9 For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

E25.51.10 The median slab shall be moist cured in accordance E25.51.

E25.51.11 After the finishing and brooming is completed, the surface shall be sprayed with an initial coating of curing compound. As soon as initial set has occurred, the slab surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

E25.52 Form Removal

E25.52.1 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.

E25.52.2 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.

E25.52.3 Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads.

E25.52.4 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.

E25.53 Patching of Formed Surfaces

E25.53.1 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.

E25.53.2 Any repair or surface finishing started before this inspection may be rejected and required to be removed.

E25.53.3 Patching of formed surfaces shall take place within 24 hours of formwork removal.

E25.53.4 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.

E25.53.5 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.

E25.53.6 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.

E25.53.7 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.

E25.54 Cold Weather Concreting

E25.54.1 General

(a) The requirements of CSA Standard A23.1-09 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.

E25.55 Hot Weather Concreting

E25.55.1 The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

E25.55.2 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.

E25.55.3 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.

E25.55.4 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.

E25.55.5 Sun shades and wind breaks shall be used as required during placing and finishing.

E25.55.6 Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

E25.55.7 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.

E25.55.8 Hot weather curing shall follow immediately after the finishing operation.

E25.56 Hot-Weather Curing

E25.56.1 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.

E25.56.2 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.

E25.57 Job Preparation

E25.57.1 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.

E25.58 Concrete Temperature

E25.58.1 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 E25.2, “Acceptable Concrete Temperature”, for the indicated size of the concrete section.

TABLE E25.2: ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, M	TEMPERATURES °C	
	MINIMUM	MAXIMUM
Less than:		
1	10	27
1.2	5	25

E25.59 Cleanup

E25.59.1 The Contractor shall cleanup equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E25.60 Concrete Quality

E25.60.1 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.

E25.60.2 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.

MEASUREMENT AND PAYMENT

E25.61 Structural Concrete

E25.61.1 Supplying and placing structural concrete 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, 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

(a) Items of Work:

i) Supply and Place Structural Concrete:

- Abutments;
- Pier Caps;
- Shoulder and Median Traffic Barriers;
- Sidewalk/ATP Slabs
- Retaining Wall Cladding and Mock-Up Panels;
- Retaining Wall Caps;

E25.61.2 Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods including heating and hoarding, 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.

E25.61.3 Supplying and placing of structural concrete for the pumping station sub-structure and pumping station masonry fill will paid for in accordance with E44 and E45.

E26. SUPPLYING AND PLACING REINFORCEMENT

DESCRIPTION

E26.1 General

E26.1.1 This Specification covers all operations relating to the supply, fabrication, anchoring, and placement of the following reinforcing bars:

(a) Stainless steel reinforcing bars for wall cladding, and Wall Caps;

(b) Hot dipped galvanized reinforcing steel for pier caps, traffic barrier and median barrier; and

(c) Plain reinforcing for the Abutment, Wing Walls, Pumping Station substructure and curbs.

E26.1.2 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.

E26.2 Submittals

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

(b) The contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor, and the qualifications of Operators, the Shop Drawings including bar lists and the mill certificates.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed materials to be used.

MATERIALS

E26.3 General

E26.3.1 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.

E26.3.2 Storage of materials shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1-09, Storage of Materials, except as otherwise specified herein.

E26.4 Plain and Galvanized Steel Reinforcing

E26.4.1 Plain and Galvanized Steel reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

E26.4.2 All plain and galvanized steel reinforcing shall conform to the requirements of CSA Standard CAN/CSA G30.18-09, Grade 400W, Billet-Steel Bars for Concrete Reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel.

E26.4.3 All plain and galvanized steel reinforcing 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 G30.18-09.

E26.5 Galvanizing

E26.5.1 Shop Applied

(a) The galvanizing shall be shop applied and strictly in accordance with ASTM A767M-09a to a retention equal to a Class II level (610 gm/m2), except as otherwise specified herein.

(b) 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.

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

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

(e) 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.

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

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

(h) 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.

E26.5.2 Field Applied

(a) Field applied galvanized coating shall be brush applied:

i) Zinga, as supplied by Pacific Evergreen Industries Ltd., West Vancouver, BC, Canada (604) 926-5564

ii) ZRC Cold Galvanizing Compound, as supplied by ZRC Worldwide, 145 Enterprise Drive, Marshfield, MA 02050 USA (781) 319-0400

iii) Or equal as acceptable by the Contract Administrator in accordance with B8.

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

(c) 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.

E26.5.3 Galvanizing Touch-Up and Field-Applied Galvanizing

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

(b) Approved products are:

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

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

E26.6 Stainless Steel Reinforcing

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

(b) Stainless Steel Reinforcing Bars: to ASTM A955M, 300 Series, Grade 420, Type 2205 Duplex or Type 316 LN.

(c) The reinforcement deformations shall conform to the requirements of ASTM A615.

(d) The stainless steel reinforcement shall be mechanically or chemically descaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag or oxidation.

(e) Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel brushes only.

E26.7 Bar Accessories

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

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

(c) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator in accordance with B8.

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

CONSTRUCTION METHODS

E26.8 General

E26.8.1 Fabrication of Plain and Galvanized Reinforcing Steel

(a) Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18-09 to the lengths and shapes as shown on the Drawings.

E26.8.2 Supply

(a) Plain and Galvanized steel reinforcement shall be bent to the proper shape in a plant that has suitable devices for bending as recommended in the Reinforcing Steel Institute of Canada (RSIC) Manual at Standard Practice. Heating shall not be used as an aid in bending.

(b) Stainless steel reinforcement shall be bent to the proper shape in a plant that has suitable devices for bending stainless steel as recommended in Reinforcing Steel Institute of Canada (RSIC) Manual of Standard Practice. Heating shall not be used as an aid in bending. The equipment used in the plant shall not cause any surface contamination or damage to the surface of the bars. Stainless steel shall be tagged, indicating the mill and fabricator, stainless steel type and grade, and bar mark number including stainless designation.

E26.8.3 Preparation of Galvanized Steel Reinforcing

(a) 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.

(b) Remove all welding slag, splatter, anti-splatter compounds, and burrs prior to delivery for galvanizing.

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

(d) Remove by blast cleaning or other methods surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation.

(e) Hooks or bends should be smooth and not sharp. 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

E26.8.4 Handling and Storage

(a) General

i) The Contractor shall handle and store the reinforcement in a manner that ensures it is not damaged or contaminated with dirt or other materials.

ii) The reinforcement shall not be placed directly on the ground. Timber pallets, platforms, skids or other supports shall be placed under the reinforcement to keep it free from dirt and mud and to provide easy handling.

iii) Prior to concrete placement, the Contractor and Contract Administrator shall inspect the reinforcement for surface damage.

(b) Galvanized Steel Reinforcement

i) All Galvanized steel reinforcement shall be clean and free from paint, oil, millscale and other injurious defects.

ii) Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area and tensile properties of a hand-wire-brushed specimen are not less than the requirements specified herein.

(c) Stainless Steel Reinforcement

i) All stainless steel reinforcement shall be free of mud, oil and other contaminants that adversely affect bonding strength, and deposits of iron and non-stainless steel. Stainless steel reinforcing bars will be rejected if:

- any area of contamination of the stainless steel by iron exceeds 100 mm in length;
- two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or
- there are frequent small occurrences of rust contamination along the full length of the bar.

ii) If stainless steel reinforcing bars have been rejected due to excessive iron contamination, the Contractor may attempt to treat the bar to remove the contamination. This treatment can be accomplished by mechanical cleaning with a (stainless steel) wire brush, or by a polishing machine, or by chemical treatment (pickling). If the treatment(s) are not successful, the contaminated bar(s) shall be replaced at no cost to the Owner.

iii) If stainless steel reinforcing bars are mechanically damaged the bars will be rejected and the Contractor shall replace the rejected bars at no cost to the Owner. Any cuts into a bar, sharp tears or flattening of the deformations on the bars are all mechanical damage to the bars which will be cause for rejection.

E26.8.5 Placing and Fastening

(a) General

i) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcement. All reinforcement shall be accurately placed in the positions shown on the Drawings and firmly tied and chaired before placing the concrete.

ii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcement at the required location and ensuring the specified concrete cover over the reinforcement shall be made from precast concrete or non-rusting metal. Precast concrete supports of approved shape and dimensions, with compressive strengths equal to or exceeding the placed concrete, are acceptable. Any non-rusting metal chairs protruding through the surface of the hardened concrete shall be cut back at least 25 mm, and the holes filled. Non-rusting metal chairs shall not be used to support reinforcement on surfaces that are to be exposed. Where possible, this reinforcement is to be supported

entirely from above. The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

iii) Immediately before placing, concrete reinforcement shall be free of all material that would reduce the bond to concrete.

(b) Placing Plain and Galvanized Steel Reinforcing

i) 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.

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

iii) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator. A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.

iv) Following placement of galvanized-coated bars, all areas of damaged coating shall be repaired using approved touch-up coating material specified in E26.5.2.

v) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. Welding or tack welding or reinforcing steel will not be allowed. Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

(c) Placing Stainless Steel Reinforcement

i) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. All tools used for placing shall be stainless steel and shall not be contaminated with iron or non-stainless steel. Welding or tack welding of stainless steel reinforcement will not be allowed. Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

E26.8.6 Tying Reinforcement

(a) Plain and Galvanized Steel Reinforcement

i) For lapping galvanized steel bars at the joints and intersection, an ample supply of annealed wire at least 1.5 mm in diameter shall be provided. Proper cutting pliers shall be used and the bending and typing of the wires done as neatly as possible. Twisted ends of the tie wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcement.

(b) Stainless Steel Reinforcement

i) For lapping stainless steel reinforcement at joints and intersections, an ample supply of stainless steel wire shall be provided. The wire shall not be contaminated with iron or non-stainless steel. Proper stainless steel cutting pliers shall be used and the bending and tying of the wires done as neatly as possible. Twisted ends of the wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcement. All tools used shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

E26.8.7 Splicing

(a) General

i) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings will not be permitted without the written approval of the Contract Administrator. Welded splices will not be permitted.

(b) Plain and Galvanized Steel Reinforcing

i) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of 35 bar diameters lap length shall be provided.

(c) Stainless Steel Reinforcement

i) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of 35 bar diameters lap length shall be provided.

E26.9 Quality Control

E26.9.1 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.

E26.9.2 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.

E26.9.3 Quality Testing

(a) Quality control testing will 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.

MEASUREMENT AND PAYMENT

E26.10 Supplying and Placing Reinforcing Steel

E26.10.1 Supplying and Placing Reinforcing Steel shall be measured on a weight Basis, as computed from the reviewed Shop Drawings and will 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 completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.

E26.10.2 Items of Work:

(a) Supplying and Placing Reinforcing Steel Bars

i) Plain

ii) Galvanized
iii) Stainless Steel

E26.10.3 The measurement excludes the mass of bar accessories.

E27. CONCRETE FORMING AND ACCESSORIES FOR ARCHITECTURAL WORKS

DESCRIPTION

E27.1 General

E27.1.1 This Specification covers all operations relating to “Concrete Forming and Accessories” in a manner herein specified and all other related works:

E27.1.2 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.

E27.2 Related Specifications

E27.2.1 This Specification covers all operations relating to “Concrete Forming and Accessories” in a manner herein specified and all other related works:

E27.3 References

E27.3.1 Canadian Standards Association (CSA International)

E27.3.2 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

E27.3.3 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.

E27.3.4 CSA O121-08(R2013), Douglas Fir Plywood.

E27.3.5 CSA O151-09, Canadian Softwood Plywood.

E27.3.6 CSA O153-M1980(R2008), Poplar Plywood.

E27.3.7 CAN/CSA-O325.0-92(R2003), Construction Sheathing.

E27.3.8 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.

E27.3.9 CSA S269.1-1975(R2003), Falsework for Construction Purposes.

E27.3.10 CAN/CSA-S269.3-M92(R2008), Concrete Formwork, National Standard of Canada

E27.4 Submittals

E27.4.1 Submittals in accordance with E3.1.

E27.4.2 Product Data:

(a) Submit manufacturer's instructions, printed product literature and data sheets for insulated concrete forms, ties, joints, and braces and include product characteristics, performance criteria, physical size, finish and limitations.

E27.4.3 Submit Shop Drawings for formwork and falsework.

(a) Drawings shall be stamped by a professional engineer registered in the Province of Manitoba.

E27.4.4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.

E27.4.5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

MATERIALS

E27.5 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.

E27.6 Formwork materials:

E27.6.1 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

E27.7 Form ties:

E27.7.1 For Architectural concrete, use snap ties complete with plastic cones and concrete plugs to match colour of wall.

E27.8 Form Liners: for creating textures in poured-in-place concrete.

E27.8.1 Pattern and Texture

(a) Custom Form Liner to generally match design motif on Construction Drawings.

(b) Design of form liners to be approved by Landscape Architect prior to manufacturing of form liners.

CONSTRUCTION METHODS

E27.9 Fabrication and Erection

E27.9.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings:

E27.9.2 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

E27.9.3 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

E27.9.4 Do not place shores and mud sills on frozen ground.

E27.9.5 Provide site drainage to prevent washout of soil supporting mud sills and shores.

E27.9.6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

E27.9.7 Align form joints and make watertight.

(a) Keep form joints to minimum.

E27.9.8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

E27.9.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

E27.9.10 Construct forms for architectural concrete, and place ties as indicated.

(a) Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

E27.9.11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

(a) Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

E27.9.12 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

E27.10 Removal and Reshoring

E27.10.1 Leave formwork in place for following minimum periods of time after placing concrete.

(a) 7 days for walls.

E27.10.2 Remove formwork when concrete has reached 65% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

E27.10.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

E27.10.4 Space reshoring in each principal direction at not more than 3000 mm apart.

E27.10.5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

MEASUREMENT AND PAYMENT

E27.11 Form Liners and Accessories used for creating the pattern and texture in the cast-in-place concrete retaining walls will be incidental to “Supply and Place Structural Concrete, Retaining Wall Cladding”.

E28. SUPPLY AND INSTALLATION OF SPHERICAL BEARINGS

DESCRIPTION

E28.1 General

E28.1.1 This Specification covers all operations relating to the following Work:

(a) Supply, fabrication, delivery and installation of self-lubricating bronze spherical bearing assemblies complete with anchor bolt assemblies, top plates, sole plates, bronze plates, bed plates, base plates, lock-up devices, and incidental components and fasteners.

(b) Quality control of materials and fabrication.

(c) Metallizing and/or galvanizing of steel components.

(d) The Bearing fabricator shall be responsible for the design of the bearings; the bearing dimensions shown in the Drawings are guidelines and for reference unless specified otherwise.

E28.1.2 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.

E28.2 References and Related Specifications

All related Specifications and reference standards shall be current issue or latest revision at the first date of tender advertisement.

E28.2.1 Related Specifications

(a) E28 Supply and Installation of Structural Steel for Railway Bridges

E28.2.2 References

(a) AREMA Chapter 15 – Steel Railway Bridges

(b) CSA G40.21-13 – Structural Quality Steels

(c) ASTM A572/A572M-12a - High-Strength, Low-Alloy Columbium, Vanadium Structural Steel

(d) ASTM A325-10e1, Type 3 – Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

(e) ASTM F1554-07ae1 – Anchor Bolts, Steel, 36, 55 and 105 ksi Yield Strength

(f) ASTM B22-13 – Bronze Castings for Bridges and Turntables

(g) CSA W59-03 (R2008) – Welded Steel Construction (Metal Arc Welding)

(h) AWS D1.5-95/D1.5M:2010 – Bridge Welding Code

(i) CSA W47.1-09 – Certification of Companies for Fusion Welding of Steel Structures (25a) AISC Category III Major Steel Bridges

(j) ASTM B88-13/AWS C2.18-93/SSPC-CS 23.00 – Sprayed Metal Coatings for Atmospheric Corrosion Protection – Protection of Steel with Thermal Sprayed Coatings of Aluminium and Zinc

(k) ASTM A123/A123M-12 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(l) ASTM A153/A153M-09 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware

(m) ASTM B695-04 (2009) – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

(n) AWS C2.23/C2.23M:2003 Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

(o) CN Standard Details – S15, S16 & S17

E28.3 Submittals

The Contractor shall submit the following documents to the Contract Administrator, in accordance with E3-Shop Drawings.

E28.3.1 A complete set of Shop Drawings prior to commencement of fabrication:

(a) Submit within two (2) weeks from award of contract, Shop Drawings as detailed in this section. Submit Shop Drawings for review before any shop work is commenced.

(b) 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.

(c) Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings.

(d) In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings.

(e) Clearly indicate 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.

(f) Clearly indicate shop and erection details, including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.

(g) All changes in material from that specified shall be underlined in red on all prints submitted for review.

(h) After review, provide corrected drawings in electronic "PDF" format.

(i) No alterations shall be made to any reviewed plan without the written consent of the Contract Administrator.

(j) Correctness of all Shop Drawings, irrespective of any review by the Contract Administrator, shall be the responsibility of the Fabricator.

(k) 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".

(l) Drawings shall be drawn to the same system (Metric or Imperial) as the Contract Drawings.

(m) Any materials ordered prior to the review of the shop detail drawings shall be at the Fabricator's risk.

E28.3.2 Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

MATERIALS

E28.4 Products and Materials

E28.4.1 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.

E28.4.2 Structural Steel

(a) Steel for the masonry plates, bed plates, shoe plates, transition plates, sole plates, base and top plates and bolting clips shall be in accordance with CSA G40.20-13/G40.21-13, Grade 300W (ASTM A572 / A36 Grade 42).

E28.4.3 Bronze Plate

(a) Bronze Bearing metal shall meet the requirements of A.S.T.M Specification B22-09e2, Copper Alloy UNS No. C91100 as specified in the Drawings.

E28.4.4 Finishes and Tolerances

(a) Bearing plates shall be furnished to the sizes shown on the Drawings.

(b) Bearings shall be machine finished and the surface roughness when measured in accordance with ASME B46.1-2009 shall not exceed the following:

i) Expansion Bearing Plates: 125 micro inches.

ii) Fixed Expansion Bearing Plates: 250 micro inches.

iii) Top Surface of Bronze Spherical Surface: 63 micro inches.

(c) The bearing surfaces of the opposing steel plates shall also be finished in the same manner.

E28.4.5 Lubricant

(a) Spherical surface of bronze bearing plate shall be provided with trepanned recesses which shall be filled with a lubricating compound capable of withstanding the atmospheric elements and consisting of graphite and metallic substance with a lubricating binder. The compound shall be pressed into the recesses by hydraulic presses so as to form dense, non-plastic lubricating inserts. The lubricant shall be Lubrite, or approved equal in accordance with B8. Materials, which do not have lubricating qualities or promote chemical or electrolytic reactions, will not be acceptable. The total lubricating area (the trepanned recesses) shall comprise not less than 25% of the total bearing area of the plate.

(b) Coefficient of Friction: The coefficient of friction between the self-lubricating plates and the steel plates in contact with them shall not exceed 0.10 when subjected to the designed unit loading and also at twice the designed unit loading.

E28.4.6 Corrosion Protection

(a) All non-sliding bearing surfaces shall be zinc metallized with a minimum coating of 0.25 mm in accordance with SSPC CS23.00/AWS C2.23M.

(b) All edges of steel (bearing plates, etc.) to be metallized shall be slightly rounded in order that metallizing will adhere.

E28.4.7 Bolts

(a) Supply all bolts as detailed on the Drawings.

i) Bolts shall conform to ASTM A325 Type 3 or as noted in the Drawings.

ii) Nuts shall conform to ASTM A563 Grade DH3.

iii) Washers shall conform to ASTM F436 Type 3.

iv) Anchor bolts shall conform to ASTM F1554 Grade 105.

(b) Bolts, washers and nuts shall be hot dip galvanized in accordance with ASTM A153/153M.

E28.4.8 Rubber Cushioning (Levelling) Pads

(a) The Fabricator shall supply and place 6 mm rubber cushioning pads under the base plates where indicated on the Drawings.

(b) Rubber cushioning pads shall be made from neoprene, durometer harness 60 conforming to A.R.E.M.A. Chapter 15, Section 10.6, Clause 10.6.2.1 and meeting the requirements of Table 10-3 Elastomeric Material Property Test Requirements.

(c) The Fabricator shall submit a certificate from his supplier to the Contract Administrator stating the requirements of the above clause have been met.

CONSTRUCTION METHODS

E28.5 General

E28.5.1 Finished Surfaces

(a) Metal-to-metal contact surfaces within bearings shall be prepared either by machining or fine grinding. As far as practicable, machining shall be carried out after welding has been finished. Machining of sliding contact surfaces shall be carried out only in the principal direction of movement. Care shall be taken to remove abrasive materials from finished surfaces, which shall also be cleaned with a degreasing agent. Finished surfaces shall be protected from contamination and/or mechanical damage.

E28.5.2 Bolts and Bolt Holes

(a) Bolt holes shall be drilled or reamed. Where shown on the Drawings, bolts or screws shall be of a vibration resistant type. Taper washers of the correct angle of taper shall be provided under all heads and nuts bearing on beveled surfaces.

E28.5.3 Welding

(a) 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.

E28.5.4 Final Assembly and Clamping

(a) After final inspection and acceptance of the various parts of the finished bearing they shall be assembled and clamped together. Bearings shall be preset at the time of fixing the clamping devices. All deleterious material shall be excluded from sliding and other contact surfaces.

(b) Unless otherwise noted, finished bearings shall be attached to the bridge span by the steel span Fabricator.

E28.5.5 Marking

(a) Completed bearings shall have the supplier's name (or trademark) and a serial number indelibly marked thereon. The serial number shall be unique and such as to enable other bearings manufactured at the same time to be traced through the production control records should the need arise. Where practicable the serial number shall also be visible after installation of the bearing in the structure. The top of each bearing shall be clearly marked and the size and direction or preset, if any, and the direction of installation shall be indicated.

E28.5.6 Manufacturing Tolerances

(a) The tolerances given in this clause shall be observed unless otherwise specified or approved by the Contract Administrator.

(b) Types of Tolerances

i) Size: Tolerances for size referred to in this special provision shall be taken to be variations from the normal dimensions. They shall be used to control the overall dimensions and components with respect to length, thickness, height and diameter.

ii) Fit: Tolerances for fit referred to in this special provision relate to clearance and shall be taken as the difference between the sizes of an element and the hole in which it fits, where this difference is positive.

(c) Overall Dimensions of Assembled Bearings

i) General: Overall dimensions of assembled bearings shall be within ± 3 mm.

ii) Parallelism of Outer Surfaces: When designed to be parallel, the tolerance on parallelism of the upper surface of a bearing with respect to the lower surface of the bearing, as datum, shall be 0.2% of the diameter for surfaces circular in plan and 0.2% of the longer side for surfaces rectangular in plan.

(d) Dimensions of Bearing Parts

Spherical Bearings:

i) Tolerance on profile of surface for spherical bearings shall be 0.0002 Xh mm or 0.24 mm, whichever is the greater, where “X” is the length of the chord (in mm) between the ends of the bronze surface in the direction of rotation, and “h” is the projection of the bronze (in mm) above the top of the confining recess.

ii) The tolerance on size with respect to the radius of the curved surface on the finished bearing shall be 3% of the intended radius.

iii) The surface roughness Ra of metal curved sliding surfaces shall not exceed 0.5 µm.

E28.5.7 Handling, Transport, Storage and Installation

(a) Care and Protection

i) During handling, transport and storage, bearings shall be kept clean and protected from mechanical damage, heat, contaminants and other deleterious effects.

(b) Handling Devices

i) Suitable handling devices shall be provided as required. Temporary clamping devices shall be used to maintain the correct orientation of the parts but shall not be used for slinging suspending bearings unless specifically designed for this purpose.

(c) Disassembly of Bearings

i) In order that moving surfaces are not contaminated, bearings should not normally be dismantled after leaving the manufacturer’s works, but, if for any reason they are, then this should only be done under expert supervision and the manufacturer’s assistance should be sought.

E28.6 Quality Control/Quality Assurance

E28.6.1 Quality Control

(a) Materials and Workmanship

i) The testing and inspection of materials and workmanship used in the manufacture of bearings shall be carried out to ensure compliance with this Specification. Test Certificates shall be made available for inspection by the Contract Administrator prior to the shipment of bearings.

ii) Testing of complete bearings shall be carried out in accordance with the requirements of AREMA Chapter 15.

- For spherical bronze bearings, this will include a minimum of one Coefficient of Friction test and one Proof Load test to 150 percent of the bearing’s rated design capacity, as specified in Clause 11.6.4.

(b) Testing of Complete Bearings

i) Testing of complete bearings, when specified or required by the Contract Administrator, shall be carried out in accordance with his instructions. The bearings shall be considered satisfactory when the results of the test comply with this special provision and any other special requirements specified by the Contract Administrator.

E28.6.2 Quality Assurance

(a) 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.

(b) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contractor Administrator shall be allowed free access to the necessary parts of the Works.

E28.7 Fabrication Guarantee

E28.7.1 Guarantee

(a) The bearing supplier shall provide a written guarantee stating that the bearings will perform satisfactorily within the design rate of movement and under the design loads for a period of 5 years from the date of Issuance of Acceptance Certificate. The supplier shall state that they have reviewed the installation procedures and that the Fabricator was present on site and that the installation was done in accordance with the Fabricator's recommendations. The Fabricator shall guarantee the replacement of the bearings at no cost in the event that the bearings do not perform satisfactory within the design range of movement and under the design loads.

MEASUREMENT AND PAYMENT

E28.8 Supply, fabrication, delivery and installation of spherical bearings

E28.8.1 The supply, fabrication, and delivery of spherical bearings will be measured on a unit basis and paid for at the Contract Unit Price per each 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, accepted and measured by the Contract Administrator.

(a) Items of Work:

i) Supply, fabrication, and delivery of spherical bearings

- Fixed Bearings
- Expansion Bearings

E28.9 Installation of spherical bearings

E28.9.1 The installation of spherical bearings will be measured on a unit basis and paid for at the Contract Unit Price per each 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, accepted and measured by the Contract Administrator.

(a) Items of Work:

i) Installation of spherical bearings

- Fixed Bearings
- Expansion Bearings

E29. WATERPROOFING FOR RAILWAY BRIDGES

DESCRIPTION

E29.1 General

E29.1.1 This Specification covers all operations relating to the Waterproofing for Railway Bridges.

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 Works as hereinafter specified.

E29.1.3 In addition to the applicable sections of AREMA Chapter 8, Part 29.

E29.1.4 All steel decks shall be waterproofed.

MATERIALS

E29.2 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.

E29.3 Unless otherwise approved in writing by the Contract Administrator, the waterproofing membrane shall be as follows:

E29.4 Steel Deck

E29.4.1 One layer of 0.09 in (2.4 mm) thick butyl rubber, secured with an approved adhesive.

E29.4.2 Seamless spray applied system

(a) Two-component elastomer membrane such as bridge deck membrane as manufactured by Bridge Preservation.

(b) Two-component methyl methacrylate resin membrane as manufactured by Stirling Lloyd.

E29.4.3 General Requirements

(a) All waterproofing systems to be applied in accordance to the manufacturers' specification.

(b) Surface preparation of members to be waterproofed shall be carried out in accordance to the waterproofing manufacturers' requirement.

(c) Steel deck to be waterproofed shall be detailed with countersunk bolt connections.

E29.5 All deck or bridge joints shall be sealed against egress of water dropping onto bridge seats or roadways below.

E29.6 Membrane Protection – Asphaltic Panels

E29.6.1 Asphaltic panels shall be a minimum 3/8 in (10mm) thickness laid in two layers with staggered joints for membrane protection. Alternates must be submitted to the Contract Administrator for review with the Railway, and must be approved in writing by the Contract Administrator.

MEASUREMENT AND PAYMENT

E29.7 Supplying and Placing Waterproofing

E29.7.1 Supplying and placing waterproofing shall not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for the "Supply and Placement of Waterproofing", 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.

E30. SUPPLY AND INSTALLATION OF STRUCTURAL STEEL FOR BRIDGE

DESCRIPTION

E30.1 General

E30.1.1 This Specification covers all operations relating to the supply, fabrication, shop assembly, loading, blocking, delivery and erection of structural steel as shown or described on the Drawings in this Specification including the following:

(a) plate girders;

(b) stiffeners;

(c) diaphragms;

(d) jacking beams;

(e) floor beams;

(f) cross bracing;

(g) gusset plates;

(h) lifting devices;

(i) all shop and field high strength connection bolts;

(j) shop and field welds;

(k) trainman's walkway grating, checker plate, support structures and field connection hardware;

(l) deck plates and deck drains;

(m) shim plates;

(n) deck angles and deck joint cover plates;

(o) fibre optic support brackets;

(p) backing plate and connections for "Welcome to Transcona" signs;

(q) all other members required to complete the steel superstructure as shown on the Drawings and specified herein; and

(r) all labour, material and equipment required to load and block the steel superstructure.

E30.1.2 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.

E30.1.3 Quality Control of materials and fabrication.

E30.1.4 Metallizing and/or galvanizing of steel components.

E30.2 References

E30.2.1 The Fabricator shall insure that the steel fabricator's foreman and welding supervisor have a copy of the Specifications and AREMA Chapter 15; and are readily available for the Contract Administrator's reference.

(a) AREMA Chapter 15 – Steel Structures

(b) CSA G40.20/G40.21-13 – Structural Quality Steels

(c) ASTM A709/A709M-13 – Structural Steel for Bridges

(d) ASTM A588/A588M-10 – High-Strength, Low-Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance

(e) ASTM A572/A572M-12a – High-Strength, Low-Alloy Columbium-Vanadium Structural Steel

(f) ASTM A36/A36M-12 – Carbon Structural Steel

(g) ASTM A500/A500M-10a – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

(h) ASTM A325-10, Type 3 – Structural Bolts, Steel, Heat Treated, 12-/105 ksi Minimum Tensile Strength

(i) ASTM F1554-07ae1 – Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength

(j) CSA W59-03 (R2008) – Welded Steel Construction (Metal Arc Welding)

(k) AWS D1.5/D1.5M:2010 – Bridge Welding Code

(l) AWS A5.29/A5.29M:2010 – Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding

(m) CSA W47.1-09 – Certification of Companies for Fusion Welding of Steel Structures (25a) AISC Category III Major Steel Bridges

(n) CSA G189-1966

(o) ASTM B833-09 – Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) for the Corrosion Protection of Steel

(p) AWS C2.18-93R – Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites

(q) AWS C2.23-03/SSPC-CS 23.00 – Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc and Their Alloys and Composites for the Corrosion Protection of Steel

(r) ASTM A123/A123M-12 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(s) ASTM A153/A153M-09 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware

(t) ASTM B695-04 (2009) – Coatings of Zinc Mechanically Deposited on Iron and Steel

E30.3 Submittals

E30.3.1 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) Two copies of Charpy V-notch certified test reports prior to the start of fabrication.

(c) 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.

iii) In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings.

(d) 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.

(e) Clearly indicate shop and erection details including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.

(f) 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".

(g) Shop Drawings shall be drawn to the same system (Metric or Imperial) as the Contract Drawings.

(h) Submit Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

(i) 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.

(j) 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.

(k) Three (3) weeks prior to shipping, provide four (4) copies of loading, blocking, and shipment scheme stamped by Professional Engineer registered in the Province of Manitoba.

(l) All joints and procedures shall be approved by the Canadian Welding Bureau in accordance to CSA W59 or AWS D1.5.

MATERIALS

E30.4 General

E30.4.1 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.

E30.4.2 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.

E30.4.3 The types and grades of structural steel used shall be as shown on the Drawings or as specified in this Specification.

E30.4.4 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.

E30.5 General Requirements for Steel

E30.5.1 Steel shall be in accordance with CSA G40.21-13 or ASTM A709, A588, A572 and A36.

E30.5.2 Grade and Types, Fracture Critical Members:

(a) CSA-G40.21-13 Grade 350AT Category 5, A709 Grade 50WT3:

i) plate girder webs and flanges
ii) end bearing stiffener plates
iii) stringers, floor beams and jacking beams (made from steel plate)

(b) CSA-G40.21-13 Grade 350AT Category 3, A709 Grade 50WT3:

i) Stringers and floor beams (from rolled sections)
ii) stringer and floor beam connection angles

E30.5.3 Grade and Types, Non-Fracture Critical Members:

(a) CSA-G40.21-13 Grade 350A, 350W, (A588, A709 and A572 with minimum actual yield strength of 50 ksi)

i) bracing

ii) struts
iii) intermediate and horizontal stiffeners
iv) knee bracing
v) deck and ballast plates
vi) walkway brackets
vii) columns/posts
viii) jacking beams when used solely for jacking and not part of a floor system
ix) gusset plates
x) all other miscellaneous components

(b) CSA-G40.21-13 Grade 300W (A572 Grade 42)
i) secondary members to be galvanized

E30.5.4 When ordering steel from the Mill, state that it will be used for railway bridge construction.

E30.5.5 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.

E30.5.6 Before the start of fabrication, supply to the Contract Administrator the results of the low temperature Charpy impact tests made in accordance with CSA-G40.21-13. Three test pieces for thickest plate of each heat of web and flange plates in the main girders shall be taken. The tests shall be taken at the temperature of -30 deg. C (-22 deg F) and shall have the following guaranteed minimum average level of energy absorption:

(a) Category 5 material - 34 Joules (25 ft-lbs)

(b) Category 3 material - 27 Joules (20 ft-lbs)

(c) For ASTM designated steels, impact test requirements will be as per Zone 3 service temperatures of Table 15-1-14 of AREMA Chapter 15 for Fracture Critical Members, and will be as per Zone 3 service temperatures of Table 15-1-2 for NonFracture Critical elements

E30.5.7 Material for Charpy specimens shall be supplied to the Contract Administrator for inspection when requested.

E30.5.8 All identification and erection marks shall be located on surfaces which will not be visible in the completed structure.

E30.5.9 Fabrication shall be carried out in the Fabricator's own plant, the use of sub-contractors 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 sub-contractors plant such as additional quality inspections, shipment, etc.

E30.6 High Strength Bolts, Nuts and Washers

E30.6.1 Bolts to ASTM A325 Type 3, nuts to ASTM A563-C3 Grade DH3 and washers to ASTM F436 Type 3. Galvanized bolted items may be used when approved by the Contract Administrator. Bolt tightening shall be provided by means of the turn-of-nut method.

E30.7 Anchor Bolts, Washers and Nuts:

E30.7.1 Anchor bolts to ASTM F1554, Grade 105 and supplied with UNC threads as shown on Drawings. Steel plate washers shall be of sufficient area to completely cover each hole, with a minimum yield strength of 250 MPa (36 ksi). Nuts shall be specified as ASTM A563, heavy-hex style, to accommodate overtapping of threads due to metallized coatings. Anchor bolts, washers and nuts shall be galvanized.

E30.8 Welding

E30.8.1 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.

E30.8.2 Gas metal-arc, electrogas, and electroslag welding are not permitted.

E30.8.3 Welds between the web and flange plates shall be made in the flat position, except that 8 mm (5/16") fillet welds may be made in horizontal position.

E30.8.4 The fabrication of steel members designated herein or on design plans as fracture critical members and the materials making up those members shall be in accordance with the requirements set forth in AREMA Manual for Railway Engineering, Chapter 15, Section 1.14 - Fracture Critical Members. All welding for fracture critical members shall be in accordance to AWS D1.5, Section 12.

E30.8.5 Welding electrodes and fluxes shall conform to the latest revised editions of:

(a) CSA W48 / AWS D1.5/D1.5M for submerged arc welding

(b) CSA W48 / AWS D1.5D1.5M for manual welding

(c) AWS A5.29 / A5.29M for flux cored arc welding

E30.8.6 The deposited weld metal shall have atmospheric corrosion properties and Charpy V-Notch impact resistance properties similar to the parent metal being welded to.

E30.8.7 The electrodes for manual welding shall be low-hydrogen Type E55018-C3 (E8018-C3).

E30.8.8 The electrode for flux core welding shall be Low Hydrogen E8XTX-Ni1 (E7XT8-Ni1).

E30.8.9 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 5mm (3/16").

E30.8.10 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.

E30.8.11 All joints and procedures shall be approved by the Canadian Welding Bureau in accordance to CSA W59 or AWS D1.5.

E30.8.12 All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.

E30.8.13 Butt welds of tension flange plates shall be stress-relieved in accordance with procedure described in Clause 5.12 of CSA Standard W59 or Section 4.4 of AWS D1.5.

E30.8.14 Fillet welds between flange and web plates and between end stiffeners and web plates will be NDT tested.

E30.8.15 Flange and web butt welds will be inspected (after stress relieving when applicable) by approved radiographic and ultrasonic methods and approved before assembly of flanges to the web. Standards of acceptance for radiographic, ultrasonic or magnetic particle examination of welds shall be as specified in CSA Standard W59, Clause 12.5 / AWS D1.5, Section 4.4.

E30.9 Checker Plate

E30.9.1 Checker plate to be attached to Trainman's Walkways grating shall be Grade CSA G40.21 38W (260W) with have a minimum thickness of 4.8mm, manufactured by Essar Steel Algoma Inc., or approved equal in accordance with B8.

E30.9.2 Connections to be flush/countersunk to checker plate to be designed by Contractor and approved by the Contract Administrator.

E30.9.3 Checker plate shall be hot-dipped galvanized and cut to the dimensions shown on the Drawings. If welds are required, all welds after galvanizing shall be wire brushed clean and coated with "Z.R.C. Cold Galvanizing Compound" supplied by Kerry Industrial Supplies, Agincourt, Ontario, or other approved liquid galvanizing material. The material shall be applied in strict accordance with Manufacturer's specifications and approved by the Contract Administrator.

E30.10 Grating

E30.10.1 Grating for Inspection Catwalks shall be Standard Flowforge Steel Grating Type 30-102M, size of bearing bars 38mm x 3.2mm as manufactured by Fisher & Ludlow, or approved equal in accordance with B8.

E30.10.2 Grating for Trainman's Walkways shall be Standard Flowforge Steel Grating Type 30-102M, size of bearing bars 38mm x 3.2mm as manufactured by Fisher & Ludlow, or approved equal in accordance with B8. Supply of the grating shall include saddle clips and 13mm bolts.

E30.10.3 Grating panels shall be fully banded.

E30.10.4 Grating panels shall be welded to angle retainers.

E30.10.5 Grating shall be hot-dipped galvanized and cut to the dimensions shown on the Drawings. All welds after galvanizing shall be wire brushed clean and coated with "Z.R.C. Cold Galvanizing Compound" supplied by Kerry Industrial Supplies, Agincourt, Ontario, or other approved liquid galvanizing material. The material shall be applied in strict accordance with Manufacturer's specifications.

E30.10.6 Gratings shall be fabricated and installed in such a manner that the cross bars in each grating runs continuously in the same direction.

E30.11 Hot Dip Galvanizing

E30.11.1 All steel except anchor bolts, where called for on the drawing as being hot-dip galvanized shall be executed after fabrication of the element and shall be in accordance with CSA Standard G164 "Hot Dip Galvanizing of Irregularly Shaped Objects" (ASTM A123) and shall have a minimum mass of zinc coating of 610 g/m2 (2 oz//ft2).

E30.11.2 F1554 Anchor bolts shall be galvanized by the following methods:- Grade 105– Zinc Hot Dip to ASTM A153 Class C

E30.11.3 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.

E30.11.4 Prior to galvanizing all steel components shall be prepared in accordance with SSPC-SP10.

E30.12 Metallization

E30.12.1 The following areas shall be zinc metallized with a minimum coating of 0.25mm in accordance with AWS C2.23-03/SSPC-CS 23.00:

(a) Girder ends and shoe plates, to the extent shown on the Drawings,

E30.13 Painting of Metalized Surfaces

E30.13.1 Painting of metalized surfaces to be in accordance with E31.

E30.14 Identification of Span

E30.14.1 Apply, where shown on the Drawings, a 8" x 12" (203mm x 305mm) span identification plate. The plate shall be installed using two 1/2" (12mm) diameter stainless steel cap screws in accordance with the Miscellaneous Section & Details drawing.

E30.14.2 The plate and screws will be supplied by the Railway.

E30.15 Fibre Optic Ductwork

E30.15.1 Supply and deliver fibre optic ductwork on the side of the main girders as detailed. Fibre optic ducts shall be 4” x 4” fabricated from 14 gauge galvanized sheet steel as manufactured by Hovey Industries and distributed by IEC Holden Inc., or approved equal in accordance with B8. The ducts shall be supplied in minimum lengths of 3 feet.

E30.15.2 Ducts shall be supplied with field assembly bolts required for a complete installation in the field by the Railway.

E30.15.3 Ducts shall be supplied with removable covers permitting the installation of fibre optic cable.

E30.15.4 At each main girder, at the end of the span the Fabricator shall supply two 45 degree elbows (one downward and one upward) in order to permit burial of the duct approximately 2 feet into the embankment.

E30.16 Bearing Levelling Pads

E30.16.1 The Fabricator shall supply and place leveling pads where indicated on the Drawings.

E30.16.2 Leveling pads shall be laminated fabric rubber such as Fabreeka, Sorbtex or equivalent.

E30.16.3 The leveling pads, where indicated, shall be fully adhered with a waterproof adhesive compatible with the pad.

CONSTRUCTION METHODS

E30.17 Work Schedule

E30.17.1 Provide with the tender a detailed work schedule in increments of not more than one week. The detailed schedule shall be in a clear, concise, bar chart form and shall clearly indicate the fabrication periods and sequences of operations of each item of work in sufficient detail so the Contract Administrator can determine the feasibility of the program and monitor the progress of the Work.

E30.17.2 When establishing the work schedule conform to D16 Detailed Work Schedule, D23 Sequence of Work, D25 Critical Stages and D26 Substantial Performance.

E30.17.3 Interim reviews of work progress based on schedule submitted by the Fabricator will be conducted as decided by the Contract Administrator and schedule updated by the Fabricator in conjunction with approval of the Contract Administrator.

E30.18 Fabrication Procedures and Tolerances

E30.18.1 General

(a) 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.

(b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(c) 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.

(d) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(e) Field high-tensile bolted splice joints in plate girders shall have all holes drilled or sub-punched and reamed using steel templates.

(f) Steel plates for main members and splice plates shall be cut and fabricated so that the direction of the applied stress shall be parallel to the direction of plate rolling.

(g) Oxygen cutting shall be in accordance with AWS D1.5 and CSA W59.

(h) Welded splice joints for welded girders shall be assembled with butting members adjusted for line and camber before the fit-up preparations are made for welding.

(i) All holes for end connections of jacking beams and end beams 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.

E30.18.2 Procedures and Tolerances

(a) Fabrication procedures and tolerances shall be in accordance with Part 3, Chapter 15, AREMA Standard, unless stated otherwise in the Specifications or on the Drawings.

(b) 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" (6mm).

(c) Flange material preheating:

i) Flange material thickness of 1 ½" (40mm) and up to 2 3/8" (60 mm) shall be preheated to 150 deg F (65 deg. C) before flame cutting or welding.

ii) Flange material thicker than 2 3/8" (60 mm) shall be preheated to 225 deg. F (107 deg C) before flame cutting or welding.

(d) All holes must be drilled from the solid or sub-punched a maximum 11/16" (18 mm) diameter and reamed.

(e) Steel templates with hardened bushings will not be required for drilling holes in gussets and bracing with 4 holes or less.

(f) Camber in girders shall be as indicated on the Drawings. Deviation from camber in girders shall not be permitted.

(g) 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" (1mm).

(h) Deviations from straightness of main girders shall not exceed 1/8" (3 mm).

(i) Submit request for approval of flange splices, other than as called for on the Drawings, with tendering documents.

(j) Field connections and bolts for deck joint cover plate:

i) Supply all bolts for shop and field connections as called for on the Drawings.

ii) 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 5% plus 5. The number of nuts and washers of each size and type furnished in excess of the nominal number required shall be 5%.

iii) All shop & field connections shall be slip-resistant (friction-type) using High Strength bolts.

iv) Bolts shall conform to A.S.T.M. Specification A325, Type 3, with matching nuts to A.S.T.M.A563 Grade DH3 and washers to A.S.T.M. F436, Type 3.

v) 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.

vi) Tightening of high strength bolts shall be executed by the turn-of-nut method as specified under Chapter 15, Part 3, Clause 3.2.3 of the AREMA.

(k) Assembly

For spans being shipped completely assembled:

i) Spans shall be shipped entirely shop assembled complete with bearing assemblies except for the following items:

ii) Walkway brackets shall be bolted to the spans in the field by others.

iii) Grating shall be secured to the brackets in the field by others.

iv) Railings shall be shop assembled in units for each span.

v) Deck joint cover plates shall be installed in the shop to ensure a snug fit along the profile of the deck plate and shall be match marked and supplied loose for installation in the field by the Railway.

vi) Cap beam connection plates and filler plates shall be bolted to cap beams as indicated.

For spans being shipped knocked down:

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 as follows:

vii) Diaphragms shall be supplied with connection angles loosely bolted.

viii) Floor beams to be connected to girders shall be supplied with connection angles loosely bolted.

ix) All other floor beams shall be supplied loose with bolts for connecting in the field by others.

x) Gusset plates and connecting angles shall be permanently bolted to the girders.

xi) Walkway brackets and grating shall be supplied loose.

xii) Deck joint cover plates shall be installed in the shop to ensure a snug fit along the profile of the deck plate and shall be match marked and supplied loose for installation in the field.

(l) For inspection purposes, all bolts must have their snug tight positions marked by the Fabricator prior to final tightening.

(m) All remaining miscellaneous steel pieces should be bundled and clearly marked as called for on the identification of pieces drawing

E30.18.3 Clean Material

(a) The material shall be clean, free from rust, mill scale, and other foreign matter before being worked in the shop and after assembly.

i) Commercial blast clean with SSPC-SP-6 (sand blast) inside and outside of main girders, its connections (including angles, stiffeners and any bolted connection to the web to ensure slip resistance connection), and surfaces that need metallizing prior to the assembly.

ii) Commercial blast clean with SSPC-SP-6 outside of External girders after assembly has been completed.

iii) Remove heavy deposits of oil or grease by Solvent Cleaning to SSPC-SP-1-63.

E30.18.4 Finish

(a) 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.

E30.18.5 Machining

(a) 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.

(b) 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:

i) Steel Slabs ANSI 2,000
ii) Heavy plates in contact in shoes to be welded ANSI 1,000
iii) Milled ends of compression members,
iv) milled or ground ends of stiffeners and fillers ANSI 500
v) Bridge rollers and rockers ANSI 250
vi) Pins and pin rollers ANSI 125

(c) Care shall be taken that the completed surfaces are protected from damage from the time of machining until the installation in a structure.

(d) 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.

(e) 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.

(f) Flat Machined Surfaces - Where called for on the Drawings, flat machined surfaces shall be obtained by planning 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.

(g) Curved Machined Surfaces - Curved surfaces shall be machined carefully in accordance with Drawings and Specifications in order to ensure correct fit of mating parts.

E30.18.6 Stress Relieving

(a) 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 these Specifications. If stress relieving is called for, it shall conform to the requirements of AWS D1.5 and CSA W59.

E30.18.7 Holes

(a) 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.

(b) 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.

(c) 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.

(d) 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.

(e) 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:

i) Centre-to-centre 12 m or less 1.0 mm
ii) Centre-to-centre over 12 m to 18 m 1.5 mm
iii) Centre-to-centre over 18 m to 24 m 2.5 mm
iv) Centre-to-centre over 24 m 3.0 mm
v) Miss-punched or miss-drilled members shall not be corrected by welding.

E30.18.8 Span Length Dimensions

(a) Particular attention shall be paid to span length dimensions. Tolerances on these dimensions shall be as per AREMA Chapter 15, Section 3:

E30.18.9 Fitted Stiffeners

(a) End stiffeners and stiffeners intended to be load supporting shall have full bearing on the flanges to which they transmit load or from which they receive load. Full bearing shall be achieved by machining or welding (using double bevel complete penetration joint) as shown on the Drawings. Stiffeners not intended to support loads shall, unless shown or specified otherwise, fit sufficiently tight to exclude water after being painted. All intermediate transverse stiffeners shall be machined to fit as required by the Drawings.

E30.18.10 Match Marking

(a) Splice plates and splices shall be shop checked for fit and match marked.

E30.18.11 Welding

(a) Specifications

i) 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.

(b) Welding of principal members shall be performed by automatic or semi-automatic submerged arc process, in accordance with CSA Standard W59-03, Welded Steel Construction or AWS D1.5.

i) Gas metal-arc, electrogas, and electroslag welding are not permitted.
ii) The fabrication of steel members designated herein or on design plans as fracture critical members and the materials making up those members shall be in accordance with the requirements set forth in AREMA Manual for Railway Engineering, Chapter 15, Section 1.14 - Fracture Critical Members. All welding for fracture critical members shall be in accordance to AWS D1.5, Section 12.

(c) 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 70mm (2 ¾”), not closer than 500mm (20”) and no larger than 5mm (3/16”).

(d) Welding Procedures and Qualification

i) 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.
ii) 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.

(e) All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.

(f) Butt welds of tension flange plates shall be stress-relieved in accordance with procedure described in Clause 5.12 of CSA Standard W59-1989 or Section 4.4 of AWS D1.5.

(g) Distortion and Shrinkage Stresses

i) 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 120oC, 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.

(h) Run-off Plates and Backing Strips

i) Run-off plates shall be used at the ends of all welds except where run-off plates are not practical and then the weld shall be run back onto itself to minimize craters forming at the end of the weld.

ii) Material to be used for backing strips and run-off plates shall conform to the same specifications as the base material and shall be of a sufficient length to prevent craters due to the stoppage of the weld.

E30.18.12 Hot-Dip Galvanizing

(a) Galvanizing, when called for on the Drawings, shall be done in accordance with ASTM A123.

(b) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material by commercial sand, grit or shop blasting or pickling prior to galvanizing. Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling.

E30.19 Inspection

E30.19.1 The City shall engage an independent inspection consultant to carry out shop inspection of the fabrication including non-destructive testing of the welds such as radiographic, ultrasonic or magnetic particle tests and any other tests deem necessary to complete the inspection. This will be in addition to the Fabricator's Quality Assurance Program.

E30.19.2 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.

E30.19.3 The following inspections shall be carried out:

(a) Geometric Control

i) Plate and Shape Sizes

ii) Dimensions

iii) Alignment

iv) Tolerances

(b) Quality of Welds

i) Visual Examination - 100% of all welds

ii) Radiograph Test Method - 100% of butt joint groove welds at flange and web splices. For bottom flanges, test to be carried out after heat treatment.

iii) Ultrasonic Test Method - 100% at flange to bearing stiffeners butt groove weld, 100% of flange to web plate butt groove weld of FCM members, 100% in the

tension zone and 10% in the compression zone of flanges and web splices of non-FCM members butt groove welds.

iv) Magnetic Particle Test Method – 100% of fillet welds for main members and 50% of fillet welds for secondary members.

(c) High Strength Bolts

i) Turn of the nut method or by torque wrench - 100% sampling of installed bolts (site installed bolts are not included)

(d) Surface Finishes

i) Cleaning

ii) Galvanizing

iii) Metalizing

(e) All joints to be radiograph inspected shall be ground flush on both sides, and shall be free of paint, scale and grease. The direction of grinding shall be perpendicular to the length of the weld.

(f) Welds requiring repairs shall be retested after repairs are made, and the cost for retesting shall be the Fabricator's expense.

E30.20 Handling, Delivery and Storage of Materials

E30.20.1 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 and lock-up devices 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.

E30.20.2 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.

E30.20.3 When transporting bridge girders using equipment other than a flatbed trailer, the Contractor shall be responsible for ensuring the following:

E30.20.4 The Contractor shall submit the temporary traffic control plan in accordance to all jurisdictions and regulation procedures, as part of the proposed erection procedure. The proper advance signing must also be in place.

E30.21 Weight Information

E30.21.1 The TOTAL WEIGHT of each fully assembled span shall be indicated at the end of the bottom flange of the span. The weight shall be stenciled on the material with a minimum 100 mm (4") high yellow waterproof letters. The weight shall be indicated in Imperial units.

E30.21.2 For all members or components that are shipped unattached to the spans, these members shall show the weight of these individual members or components on a metal tag attached thereto.

E30.22 Protective Blocking

E30.22.1 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.

E30.22.2 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.

E30.22.3 Bolts shall not be loosened or removed from attachments in order to facilitate shipping.

E30.23 Loading for Shipment

E30.23.1 Each span should be marked and tagged indicating the Span Number.

E30.23.2 Mark end of girder to identify which end will be pointing west or north when erected in the bridge by marking "West" or “North” on the top of the top flange at the end of each girder.

E30.23.3 Loading on the rail cars will be done with the West or North ends of all spans pointing to the same end of the rail car.

E30.23.4 The Fabricator shall supply and install the necessary blocking to fully support the span during shipment.

E30.23.5 Four (4) weeks prior to shipping, the fabricator shall provide the Contract Administrator for review and approval four (4) copies of loading and blocking scheme drawings, which shall be stamped and signed by a Professional Engineer.

E30.23.6 The Fabricator shall supply all material (including bolsters or swivel blocks under spans) and labour required to load and block the spans or girders to meet the Association of American Railroads (AAR) open top loading rule requirements.

(a) Load securements shall be capable of withstanding 3 times the object weight in the longitudinal direction, and 2 times the object weight in the lateral and vertical directions.

(b) Tie downs shall consist of 1” minimum diameter rods or plates only. The use of tie down cables or wires is strictly prohibited.

(c) Spans or girders over 50 feet in length can be shipped on flat cars and the fabricator shall then request flat cars from CN’s customer service when undertaking necessary transport arrangements.

(d) For spans being shipped knocked down, the fabricator shall load and block each main girder individually on separate railcars.

(e) Spans or girders are to be shipped in the vertical position.

E30.23.7 All field connection bolts, nuts, and washers shall be packed in 5 gallon (20 liters) metal cans and clearly labeled. The label will show mile and subdivision, the type and quantities of fasteners each can contains and the name and address of the receiver. The cans shall be strapped to a wooden pallet.

E30.23.8 Walkway grating panels shall be strapped in bundles of 5 or 10 pieces with steel strapping. The steel strapping must be cushioned so as not to come in direct contact with the grating panel.

E30.23.9 Walkway support structure materials shall be strapped to wooden pallets or shipped in steel drums or shall be strapped in bundles of not more than 2000 pounds each.

E30.23.10 Shipping instructions shall accompany the bill of lading to ensure that the spans arrive on site, pointing in the correct direction for erection.

E30.23.11 The Fabricator shall obtain a clearance for dimensional loads from the Engineer prior to shipment of the span(s).

E30.24 Identification of Pieces

E30.24.1 All members or components shall be identified on a metal tag attached thereto.

E30.24.2 The metal tag shall have the following information:

(a) bridge location (Mileage and Subdivision)

(b) "mark" as indicated on the Drawings.

(c) "weight" in lb. of the girders and their assembled connections.

E30.24.3 The metal tags shall be have the following characteristics:

(a) Tag format type no. 90, 18 gauge

(b) Dimension: 2 1/2 x 2 3/4"

(c) Tag information shall be engraved with min. 1/2" high letters.

(d) Metal bands shall be used to attach the tags to the components.

E30.25 Erection

E30.25.1 General

(a) Loading and erection of the girders shall be under the direction of a Registered Professional Engineer. The Engineer shall be experienced in bridge girder erection and be present for all stages of girder erection including but not limited to: loading, hauling, erection and temporary bracing (during transportation and erection).

(b) The Contractor shall be responsible for the design, supply, installation and removal of lateral stability bracing for girders as may be required during the Contractor's handling and transporting of the girders.

(c) No loose timber blocking will be permitted for used as temporary works for any aspect of girder erection.

(d) It is the Contractor's responsibility to ascertain the actual weight of the girders.

E30.25.2 Layout

(a) Before erection of structural steel, the Contractor shall satisfy himself that the location of substructure units, elevations of bridge seats and location of anchor bolts 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.

E30.25.3 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. Bolts in splices of butt joints or compression members shall not be tightened until the span has been completed. Field splices shall have a minimum of 50% of the holes filled with high strength bolts or erection bolts and the remainder of the holes filled with cylindrical erection pins immediately after erection. Erection bolts shall be of the same nominal diameter as the high strength bolts and the cylindrical erection pins shall be 1 mm larger.

E30.25.4 Girders and Diaphragms

(a) The Contractor shall ensure at all times during erection that girders are restrained adequately in both horizontal and vertical directions against wind loading, stream and debris loading, accidental blows, and other types of construction loading.

(b) Diaphragms shall not be secured firmly in position until it has been determined to the satisfaction of the Contract Administrator that the holes in the girder webs for high tensile bolting of diaphragms are correctly aligned in a direction normal to track centerline, in order to ensure proper seating of diaphragm end plates.

E30.25.5 Adjustment of Bearings and Girders

(a) After the diaphragms have been installed to the satisfaction of the Contract Administrator, the Contractor may be required to shift any bridge span as a unit in a direction parallel to the centerline of track. He may also be directed by the Contract Administrator to make adjustments to the positions of masonry and plates and neoprene pads to compensate for discrepancies in the work up to this point.

(b) Bearings and girders shall not be considered as being fixed finally in position until approval of the installation is given by the Contract Administrator, at the completion of the erection of the materials under this Specification.

E30.25.6 Drifting

(a) Drifting will be permitted during assembly only to bring the components into position without enlarging or distorting the bolt holes, and without distorting, kinking or bending the metal of any unit. If, in the estimation of the Contract Administrator, holes must be enlarged to admit the bolts, they shall be reamed.

(b) Such reamed holes shall not exceed the size of the bolt used by more than 2 mm. Oversize bolts, with a diameter of up to 3 mm larger than that shown on the plans may be used if the Contract Administrator approves the installation.

E30.25.7 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.

E30.25.8 Field Welding

(a) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings and the "American Welding Society" - Structural Welding Code - Steel, AWS D1.5 and CSA Specification W59 Welded Steel Construction.

E30.25.9 High-Strength Bolting

(a) General

i) Mating surfaces in joints to be bolted with heavy hexagon structural bolts shall be cleaned immediately prior to erection of parts. Such surfaces shall be free of dust, grease, oil, paint and all other foreign substances.

ii) Bolt holes in members shall not be enlarged nor damaged in any way.

iii) One carburized washers per bolt shall be used at all times; under the nut.

iv) Heavy hexagon structural bolts through webs of exterior girders shall be installed from outside the exterior girders.

v) High-strength bolts which have been tightened to full tension and released shall not be reused. Retightening previously tightened bolts which may have been loosened by the tightening of adjacent bolts shall not be considered as a re-use.

vi) Where an outer face of the bolted parts has a slope of more than 1:20 with respect to a plane normal to the bolt axis, a smooth beveled washer shall be used to compensate for the slope.

vii) All bolts in the ballast tray (deck plate and ballast panel plate) must be installed so that their heads are on the side of the plate in contact with the ballast.

viii) All bolts connecting the floorbeam to the girder shall be installed with the head of the bolt on the outside face of the girders. The head of the bolt may be torqued with the washer beneath the head.

(b) Bolt Tension

i) Turn-of-Nut Tightening

Unless otherwise specified, bolts shall be tightened by turn-of-the-nut method. Where necessary, the bolt may be turned while the nut is prevented from rotating. After aligning the holes in joint, sufficient bolts shall be placed and brought to a "snug-tight" condition to ensure that the parts of the joint are brought into full contact with each other. "Snug-tight" shall be defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following the initial step, bolts shall be placed in all remaining holes in the connection and brought to snug-tightness. All bolts in the joint shall be tightened additionally by the applicable amount of nut rotation specified in Table 1 with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench. If this is not practical, the bolt and nut shall be match-marked to enable the amount of relative rotation to be determined.

Table 1: Nut Rotation* from Snug-Tight Condition

Disposition of Outer Faces of Bolted Parts	**Bolt Length** [2]	**Turn**
Both faces normal to bolt axis or one face normal to axis and other face sloped 1:20 (bevel washer not used) [1]	Up To and Including 4 Diameters	1/3
	Over 4 Diameters and Not Exceeding 8 Diameters or 200 mm	1/2
	Exceeding 8 Diameters or 200 mm 2/3	
Both faces sloped 1:20 from normal to bolt axis (bevel washers not used)[1]	For all lengths of bolts	3/4

*Nut rotation is rotation relative to bolt regardless of the element (nut or bolt) being turned. Tolerance on rotation is 300 over or under for coarse thread heavy hex structural bolts of all sizes and lengths and heavy hex semi-finished nuts.

(1) Bevel washers are necessary when A490 bolts are used.

(2) Bolt length is measured from underside of head to extreme end of point.

All fasteners shall be tightened to give at least the required minimum bolt tension values, as shown in Table 2 on completion of the joint. At no time shall the bolt tension be in excess of the required minimum bolt tension by more than 15%.

Table 2: Minimum Bolt Tension

Nominal Bolt Diameter		**Minimum Bolt Tension (kN)**	
Inches	**mm**	**A325**	**A490**
½		53	67
5/8	M 16	85	107
¾	M 20	125	156
7/8	M 22	227	285
1	M 24	227	285
1 1/8	M 27	249	356
1 ¼	M 30	316	454

Nominal Bolt Diameter		Minimum Bolt Tension (kN)	
1 3/8	M 36	378	538
1 ½		458	658

ii) Checking and Testing

The Contractor shall provide equipment for purposes of checking bolt tension. This equipment shall include calibrated manual torque wrenches, and a calibrating device capable of measuring actual bolt tension.

The calibrating device shall be examined and calibrated by a testing firm approved by the Contract Administrator. The certification and calibration results shall be forwarded to the Contract Administrator. Calibration of the device shall be done immediately prior to torqueing operations. The device shall be maintained at the site by the Contractor, who shall, in the presence of the Contract Administrator, calibrate all torque wrenches prior to the torqueing operation at least once each day during which high-strength bolts are to be torqued.

In calibrating the torque wrenches, the torque equivalent of the required tension shall be determined for at least three high-strength bolts and nuts for each size to be installed in any one day. The mean value of torque of each size shall be used. In all cases where manual torque wrenches are used, torque values shall be read while the high strength nut is in motion relative to the bolt.

The Contractor shall provide the necessary equipment and personnel to check bolt tension during torquing operations. The number of checks to be made will be at the discretion of the Contract Administrator, but will not be less than:

(a) 100% of all bolts in each girder splice.

(b) 10% of all bolts in each jacking beam connection.

(c) One bolt in each connection.

All checking shall be done in the presence of the Contract Administrator. In the event the torque values, obtained during checking of tension in high-strength bolts, are not considered acceptable by the Contract Administrator, the Contractor shall then remove the bolts as directed by the Contract Administrator and replace such bolts at his own expense.

E30.25.10 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 metallized or galvanized surfaces.

ii) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E30.26 Quality Control/Quality Assurance

E30.26.1 Quality Control

(a) The Contractor shall be responsible for all quality control testing and shall complete the minimum testing requirements to the specified frequency and test procedure. All testing shall be completed by qualified personnel who are certified at the time of testing.

(b) Structural Steel

i) All structural steel shall be free of surface imperfections, pipes, porosity, laps, laminations and other defects.

(c) Welding

i) All welding shall be subject to inspection by Non-Destructive Testing. This work shall be carried out in a manner meeting with the approval 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 his own expense and to the approval of the Contract Administrator.

(d) Non-Destructive Testing

i) All welding shall be subject to inspection by Non-Destructive Testing. The Contractor shall, at his own cost, perform magnetic particle testing of all fillet welds between flanges and webs of plate girders. This work shall be carried out in a manner meeting with the approval of the Contract Administrator.

ii) The Contractor shall perform the inspections to verify that welds meet the quality requirements of the current edition of the CSA W59-03 and AWS D1.5-S and:

- All non-destructive testing performed by the Fabricator shall be done by personnel qualified under CSA W59-03 and/or AWS D1.5-S.
- The Fabricator shall submit to the Contract Administrator, in triplicate, copies of all inspections and weld testing reports.
- Butt welds in flange and web joints are to be completed, inspected, and accepted before the flange to web tee joint is made.
- Welds requiring repairs shall be retested after repairs are made, at the expense of the Contractor.

E30.26.2 Quality Assurance

(a) 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.

(b) 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.

(c) 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.

(d) 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.

(e) Inspection of welds shall not be permitted until the material temperature has cooled to below 100 degrees Celsius

(f) 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 his own expense and to the approval of the Contract Administrator.

(g) The Contract Administrator will arrange for, and the Owner will pay for, the radiographic, ultrasonic or magnetic particle tests, except that the cost of inspection of any welding repairs entailed in the fabrication will be at the expense of the steel fabricator.

MEASUREMENT AND PAYMENT

E30.27 Supply, Fabrication, Delivery and Installation of Structural Steel

E30.27.1 The supply, fabrication, delivery and installation of structural steel for the railway bridge will not be measured. This Item of Work will be paid at the Contract Lump Price and on a percentage basis as detailed herein at the Contract Lump Sum Price for "Supply, Fabrication and Delivery of Structural Steel for Bridge", 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.

(a) Twenty percent (20%) of the lump sum price will be paid upon certification that the material is in the plant, forty percent (40%) of the portion of the lump sum price attributable to each span will be paid upon successful test fit up of the entire fabrication for each span, and the remaining forty percent (40%) will be paid upon delivery of the entire fabrication for each span to the site.

E30.28 Erection of Structural Steel

E30.28.1 The erection of structural steel for the railway bridge will not be measured. This Item of Work will be paid on a percentage basis as detailed herein at the Contract Lump Sum Price for "Erection of Structural Steel for Bridge", 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.

(a) Forty percent (40%) of the portion of the lump sum price attributable to each span will be paid upon successful re-assembly of each span on site, and the remaining sixty percent (60%) will be paid upon erection of each span.

E30.28.2 The City will arrange and pay for the radiographic, ultrasonic or magnetic particle tests, except that the cost of inspection of any welding repairs entailed in the fabrication will be at the expense of the steel fabricator.

E31. PAINTING

DESCRIPTION

E31.1 General

E31.1.1 This Specification covers all operations relating to the preparation of surfaces and application of paint using approved conventional methods as shown on the Drawings and specified herein.

E31.1.2 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.

E31.2 Reference Standards

E31.2.1 Perform work in accordance with the requirements of the latest issue of the following specifications and standards:

(a) SSPC-SP1 Solvent Cleaning;

(b) SSPC-SP2 Hand Tool Cleaning;

(c) SSPC-SP3 Power Tool Cleaning;

(d) SSPC-SP10 Near White Blast Cleaning;

(e) SSPC-Vis 1 Guide to Pictorial Surface Preparation Standards for Painting Steel Surfaces.

(f) SSPC specifications are available from:

The Society of Protective Coatings Telephone: (412) 281-2331

40 - 24th Street, 6th Floor Website: http://www.sspc.org
Pittsburgh, PA 15222-4656
USA

MATERIALS

E31.3 Paint System

E31.3.1 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.

E31.3.2 The Paint system shall be the following, or accepted alternative by Contract Administrator in accordance with B8. Paint system shall be applied in accordance with the manufacturer's specifications, and to the satisfaction of the Contract Administrator.

E31.3.3 Paint System I - Epoxy Coating

(a) Amercoat 385, multipurpose polyamide epoxy coating (distributed by PPG Industries)

E31.4 Paint Color

E31.4.1 Each coat of a different colour must be approved by the Contract Administrator.

E31.4.2 Paint color shall be as follows:

(a) “Welcome to Transcona” signage, A350 steel backing installed behind the negative cut letters: Color shall be flat black as approved by the Landscape Architect.

(b) Exposed caisson steel casings: Color shall closely match the color of surrounding concrete as determined by a trial patch approved by the Contract Administrator.

(c) Metallized areas at the girder ends: Color shall be (Oxide Red) to closely match the color of surrounding weathering steel. A trial patch must first be accepted by the Contract Administrator before the remainder of the surface is painted.

E31.4.3 Mixing and application shall be in strict accordance with manufacturer's written instructions.

CONSTRUCTION METHODS

E31.5 Preparation of Metal Surfaces

E31.5.1 Clean all surfaces by removing paint, rust, mill scale, welding slag, dirt, oil, grease and other foreign substances by cleaning in accordance with SSPC-SP10 Near White Blast Cleaning.

E31.5.2 Remove all salts and surface contaminants by water blasting or steam cleaning prior to dry abrasive blasting.

E31.5.3 When cleaning by air blasting with sand, provide adequate separators and traps to remove detrimental amounts of water and oil from compressed air before reaching nozzle. Remove traces of blast products from surface and from pockets and corners by brushing with clean brushes, by blowing with clean compressed air, or by vacuum cleaning. Do not damage partially or completed work adjacent to area being cleaned.

E31.5.4 Abrasives used in shop cleaning shall be free of chlorides and other contaminants which could affect the coating being applied, and shall produce the anchor pattern required by the coating system.

E31.5.5 Hand and power tool clean areas inaccessible to blasting equipment. Such cleaning shall be in accordance with SSPC-SP2 and SSPC-SP3.

E31.5.6 The Contractor shall prepare only as much surface as can be coated with primer the same day. If unusual circumstances occur which prevent all prepared surfaces from being primed the same day, a light blast cleaning will be required over all unprimed surfaces prior to recommencement of painting.

E31.6 Degree of Cleanliness of Surfaces

E31.6.1 Prior to commencing paint application, the degree of cleanliness of surfaces must conform to the following Steel Structures Painting Council Specification:

E31.6.2 Commercial Blast Finish to SSPC-SP10 for Commercial Blast Cleaning.

E31.6.3 Hand and power tool clean to SSPC-SP2 or SSPC-SP3.

E31.6.4 Provide necessary equipment for access to assist Contract Administrator to carry out tests for cleanliness.

E31.7 Protection of Adjacent Properties and Public

E31.7.1 Protect all rail and other vehicular traffic, bridge operating equipment, buildings and machinery from abrasive sand or grit, paint spray or splash and falling objects. The Contractor shall be solely responsible for any damage or injury resulting from his operation.

E31.7.2 Protect adjacent properties, landscaping, and public, including vehicles, from any damage due to operations.

E31.8 Protection of the Environment

E31.8.1 The containment system's purpose is to prevent the debris generated during surface preparation from entering into the environment and to facilitate the controlled collection of debris for disposal.

E31.8.2 When abrasive blast cleaning is used to clean and prepare the steel surfaces, the Contractor shall contain the abrasive particles, and debris resulting from the operation.

E31.8.3 The containment system includes but is not limited to, such articles as cover panels, screens, tarps, scaffolds, supports, shrouds and ground sheets used to enclose the entire work area or a paint removal tool.

E31.8.4 The materials used for screens shall be of a commercial brand designed specifically for the purpose of containing and facilitating collection of blasting and painting debris. If woven screens are used, the material shall contain no more than 15% voids with a mesh opening not exceeding 20 mils (500 microns).

E31.8.5 The method of attaching tarpaulins to the bridge will be subject to the approval of the Contract Administrator. The welding of attachments to and the drilling holes in structural members are prohibited.

E31.9 Protection of Surfaces

E31.9.1 Apply primer or paint as soon as possible after surface has been cleaned and before deterioration of surface occurs.

E31.9.2 In the event that rusting occurs after completion of surface preparation, clean surfaces again.

E31.9.3 Prevent contamination of cleaned surfaces by sand, grit, salts, acids, alkali, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Must remove such contaminants from surface to the satisfaction of the Contract Administrator and apply paint immediately.

E31.9.4 Protect cleaned and freshly painted surfaces from excessive dust produced by traffic, and from dust, sand and grit produced by blasting operation at no extra cost.

E31.9.5 Chemical pre-treatment of bare metal surfaces shall not be permitted.

E31.10 Mixing Paint

E31.10.1 Do not dilute or thin paint for brush application; use as received from manufacturer and thin only as recommended by the manufacturer for spray application.

E31.10.2 The paint shall be mixed in a manner which will ensure breaking up of all lumps, complete dispersion of settled pigment, and provide a uniform composition. The paint shall be agitated often enough during application to keep the pigment in suspension.

E31.10.3 Mixing or keeping paint in suspension by means of an air stream bubbling under paint surface will not be permitted.

E31.11 Paint Film Thicknesses

E31.11.1 Two coats epoxy coating with a Dry Film Thickness (DFT) as directed by coating manufacturer's instructions. DFT shall be checked and accepted by the Contract Administrator.

E31.11.2 Do not exceed maximum dry film thickness recommended by coating manufacturer.

E31.12 Applying Paint

E31.12.1 Applying paint by brushing, rolling or spraying or a combination of each. Use sheepskins or daubers only when no other method is practicable in places of difficult access.

E31.12.2 Do not apply paint when:

(a) Air temperature is below $4^{o}C$ or when temperature is expected to drop to $0^{o}C$ before paint has dried.

(b) Fog or mist occur at site; it is raining or snowing; there is a danger of rain or snow.

(c) Relative humidity is above 85 percent, unless otherwise authorized by the Contract Administrator.

(d) Surface to be painted is wet, damp or frosted.

(e) Previous coats are not thoroughly dry.

(f) Steel temperature is more than $3^{o}C$ below dew point temperature.

E31.12.3 Provide all necessary instrumentation to the Contract Administrator or his/her representative to measure atmospheric conditions (i.e. ambient temperature, relative humidity, dew point, wind speed, etc.) as well as wet and dry paint thicknesses.

E31.12.4 To maximum extent possible apply each coat of paint as a continuous film of uniform thickness, free of pores. Repaint and permit to dry any thin spots or areas missed in application before next coat of paint is applied.

E31.12.5 Stripe coat edges of flanges and angles, nuts, bolts, etc. by spray or brush prior to applying full coat of paint to ensure adequate coverage on all sharp edges.

E31.12.6 Brush application:

(a) Work paint into all cracks, crevices and corners where possible and paint surfaces not accessible to brushes by spray, daubers or sheepskins.

(b) Brush out runs or sags.

(c) Leave a minimum of brush marks in applied paint.

E31.12.7 Spray application:

(a) Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied and equipped with suitable pressure regulators and gauges.

(b) Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.

(c) Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

(d) Apply paint in a uniform layer, with overlapping at edge of spray pattern.

(e) Brush out immediately any runs and sags.

(f) Use brushes to work paint into cracks, crevices and blind spots which are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers or sheepskins.

E31.13 Inspection and Quality Control

E31.13.1 The Contractor shall provide access to the Work for inspection and testing purposes.

E31.13.2 The Contract Administrator shall from time to time during the Work inspect surfaces prior to painting for degree of cleanliness and after the painting has been completed make quality control tests, i.e., wet, dry film thicknesses, adhesion, etc.

E31.13.3 Areas found to be deficient with respect to preparation of surfaces and/or painting shall be corrected and made good by the Contractor, at his cost, to the satisfaction of the Contract Administrator.

E31.13.4 Any newly painted surfaces will be considered to lack uniformity, continuity and soundness, and will be rejected, if any of the following defects are apparent.

(a) Runs, sags, holidays or shadowing caused by inefficient application methods.

(b) Evidence of poor coverage at bolts, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

(c) Surfaces which have been struck, scraped, spotted by rain or otherwise damaged.

(d) Surfaces which exhibit an objectionable texture such as orange peel, mud cracking, fish eyes, etc.

(e) Surfaces damaged by over spray.

MEASUREMENT AND PAYMENT

E31.13.5 Painting will be incidental to the “Items of Work” listed here below and no separate payment will be made.

(a) Items of Work

i) Welcome to Transcona Signage

ii) Supply and Install Rock-Socketed Caissons

iii) Erection of Structural Steel for Permanent Bridge

E32. ALUMINUM PEDESTRIAN HANDRAIL

DESCRIPTION

E32.1 General

E32.1.1 This Specification covers all operations relating to the supply and installation of the aluminum pedestrian handrail herein and as shown on the Drawings.

E32.1.2 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 completion of all Work as hereinafter specified.

E32.2 Referenced Specifications and Drawings

E32.2.1 The latest edition and subsequent revisions of the following:

(a) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

(b) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;

(c) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

(d) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings for Metal;

(e) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;

(f) CAN/CSA W59.2 – Welded Aluminum Construction; and

(g) CAN/CSA S157 – Strength Design in Aluminum.

E32.3 Submittals

E32.3.1 The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E32.3.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail. Fabrication shall take place as shown on the Drawings.

E32.3.3 The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications and mill certificates.

E32.3.4 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 City of Winnipeg Specifications proposed welding procedures and welding consumable certificates.

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

(b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

(c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding

MATERIALS

E32.4 General

E32.4.1 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.

E32.5 Material for the Aluminium Pedestrian Handrail

E32.5.1 Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6). Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.

E32.5.2 Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

E32.6 Bituminous Paint

E32.6.1 Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187.

E32.7 Handrail Anchorage System

E32.7.1 The handrail anchorage system is specified on the Drawings and is in accordance with E25.

E32.8 Aluminum Shims

E32.8.1 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.

E32.9 Aluminum Filler Alloys for Welded Construction

E32.9.1 Aluminum filler alloys for welded construction shall be one of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654.

E32.10 Hinges

E32.10.1 Hinges shall be stainless steel and manufactured by Angama, Type STBB 460, or equal as approved by the Contract Administrator in accordance with B8.

E32.11 Equipment

E32.11.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be in good working order.

CONSTRUCTION METHODS

E32.12 Layout

E32.12.1 Before fabrication and/or installation of the aluminum pedestrian handrail, the Contractor shall satisfy himself of all required aluminum rail and enclosure section dimensions, by field measurements.

E32.13 Fabrication

E32.13.1 General

(a) No fabrication shall commence until permission to do so has been received from the Contract Administrator.

(b) All fabrication shall be carried out in accordance with this Specification and the Drawings.

(c) The Fabricator shall fabricate the entire aluminum pedestrian handrail in sections, to permit the installation of the rail sections onto the concrete.

(d) The punching of identification marks on the members will not be allowed.

(e) 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.

(f) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

(g) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

E32.13.2 Sample Panel

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

E32.13.3 Cutting

(a) 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.

E32.13.4 Welding

(a) 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.

(b) 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.

(c) 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:

(d) Guided Bend Test: All bend tests should be fully guided through an angle of 180o. 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.

(e) 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.

(f) 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.

E32.13.5 Bolting

(a) 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.

(b) The finished diameter of the holes shall be not more than 7 percent greater than the nominal diameter of the fastener, except:

(c) Slotted holes for expansion purposes shall be provided as required on the Drawings

(d) 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.

(e) 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.

(f) 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.

E32.14 Installation of Aluminium Pedestrian Handrail

E32.14.1 The aluminum pedestrian handrail shall be brought on-site and accurately installed as shown on the Drawings.

E32.14.2 The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.

E32.14.3 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.

E32.14.4 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.

E32.15 Quality Control

E32.15.1 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 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.

E32.15.2 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.

E32.16 Access

E32.16.1 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.

E32.17 Testing

E32.17.1 All materials supplied under this Specification shall be subject to inspection and testing by the Contractor as directed by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator.

MEASUREMENT AND PAYMENT

E32.18 Supply and Installation of Aluminum Pedestrian Handrails

E32.18.1 Aluminium Pedestrian Handrail shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “Supply and Installation of Aluminum Pedestrian Handrails” 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.

E33. STEEL SHEET PILE WALLS

DESCRIPTION

E33.1 General

E33.1.1 This Specification covers all operations related to the construction of steel sheet pile retaining walls.

E33.1.2 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.

E33.2 Submittals

E33.2.1 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.

(b) Contractor to be certified for fusion welding in accordance with CSA W47.1-12.

MATERIALS

E33.3 General

E33.3.1 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.

E33.3.2 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 8.5mm and minimum mass of 97.60kg/m^2.

(b) Continuous interlocking (Z) section:

i) Minimum effective section modulus of 1202cm^3 per metre of wall.

ii) Minimum flange thickness of 8.5mm.

iii) Minimum web thickness of 8.5mm.

(c) Sheet Piling: As manufactured by Piling Products, Inc., section designation PZC12 or in accordance with B8 by Contract Administrator.

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

(e) Interlocks: Section of interlock bar of 1 m 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 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.

E33.3.3 Structural Steel for Wales and Miscellaneous Steel: To CAN/CSA-G40.21-13, Grade 350W.

E33.3.4 Shear Connectors

(a) Shear connectors shall be as specified and tested in accordance with AREMA Chapter 15, Clause 1.7.9.3.

(b) Diameter, length and spacing of the shear connectors shall be as indicated on the Drawings.

(c) Shear connectors shall be as manufactured by Continental Studwelding Ltd., or approved equal in accordance with B8.

E33.3.5 Nuts and Bolts: Hexagon nuts, bolts, and washers to ASTM A307-12.

E33.3.6 Fill Material: Backfill in accordance with E23.

CONSTRUCTION METHODS

E33.4 General

E33.4.1 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.

E33.4.2 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 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. Contractor to verify elevation of 1050 mm LDS and maintain clearance as indicated on the Drawings.

(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.

E33.4.3 Monitoring

(a) Sheet piles along Plessis Road:

i) The maximum lateral deflection allowance shall be 75mm; if the measured deflection exceeds this limit then the Contractor shall terminate the excavation work immediately around this area to allow for further inspection and analysis by the Contract Administrator.

ii) No excavation work around the sheet piles shall be allowed before obtaining an official approval from the Contract Administrator.

(b) The Contractor shall take all the necessary measures to protect the existing monitoring devices (slope inclinometers, settlement extensometers, vibration wires and piezometers)

(c) The Contractor shall be responsible for any damage to the monitoring devices during the course of the Works. If any monitoring devices are damaged, the Contractor shall

report to the Contract Administrator immediately and pay the cost of supply and installation of new devices as per the Contract Administrator's direction.

E33.4.4 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.

E33.4.5 Holes

(a) Patch holes in steel pile wall, except where permanent holes are indicated. Use 10mm thick plate of material equal to that of piling to patch holes and overlap not less than diameter of hole. Weld to develop full strength of plate.

(b) Make holes required in piling by drilling. Do not use flame cutting without permission of Contract Administrator.

E33.4.6 Cutting

(a) When flame cutting tops of piles and flame cutting holes in piles, adopt following procedure:

(b) When air temperature is above 0˚C, no pre-heat is necessary.

(c) When air temperature is below 0˚C, pre-heat until steel 25mm on each side of line of cut has reached a temperature very warm to hand (approximately 35˚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.

E33.4.7 Splicing

(a) Use full length piles unless splicing is indicated or unless approved by Contract Administrator.

E33.4.8 Wales

(a) Install wales prior to excavation in front of the upper sheet pile walls. Shim as required.

E33.4.9 Backfilling

(a) Backfill in accordance with Section E23 "Excavation and Backfill" and as indicated on the Drawings.

(b) Protect wales from damage or displacement during backfilling operations.

E33.5 Quality Control

E33.5.1 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).

E33.5.2 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 course of 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.

MEASUREMENT AND PAYMENT

E33.6 Supplying and Driving Steel Sheet Piles

E33.6.1 Supply and installation of steel sheet piles will not be measured. This Item of Work will 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.

E33.6.2 Splicing of piles shall be incidental to the Works.

E33.6.3 Washers, nuts, bolts, shear connectors, steel wales and other associated hardware supplied and incorporated in work, as specified, shall be incidental to the Works.

E33.6.4 Backfill behind sheet piles shall be incidental to the Work in E23.

E34. SUPPLY, FABRICATION AND ERECTION OF MISCELLANEOUS METAL

DESCRIPTION

E34.1 General

E34.1.1 This Specification covers all operations relating to the following:

(a) Supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification. Miscellaneous metal includes, but is not limited to; retaining and top plates, anchor bolts, washers and nuts for bearings; preset anchors, stainless steel anchor bolts, fasteners and pre-set anchors, and steel frames for catch basins.

(b) Quality control of materials and fabrication, including magnetic particle testing of welds.

(c) Galvanizing of miscellaneous metal.

E34.1.2 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.

E34.2 References and Related Specifications

E34.2.1 All related Specifications shall be current issued or latest revision at the first date of tender advertisement.

E34.2.2 References

(a) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel

(b) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding

(c) CSA W59, Welded Steel Construction (Metal Arc Welding)

(d) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles

(e) CSA W47.1, Certification of Companies for Fusion Welding of Steel

(f) ASTM A36, Standard Specification for Carbon Structural Steel

(g) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless

(h) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

(i) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

(j) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes

(k) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service

(l) ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

(m) ASTM A404, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings

(n) ASTM A449, Standard Specification for Quenched and Tempered Steel Bolts and Studs

(o) ASTM A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

(p) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

(q) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding

(r) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service

(s) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered

(t) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement

(u) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables

(v) ASTM B29, Standard Specification for Refined Lead

(w) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use

(x) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)

(y) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code

(z) AWS D1.1, Structural Welding Code – Steel

E34.3 Submittals

E34.3.1 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.

(d) Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

MATERIALS

E34.4 General

E34.4.1 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.

E34.4.2 The Contractor shall mark all materials to identify it's material specification and grade. This shall be done by suitable marking or by a recognized colour coding.

E34.5 Miscellaneous Metals

E34.5.1 Miscellaneous metals shall conform to the material grades specified on the Drawings, and meet the requirements and satisfy the testing procedures of CSA G40.21.

E34.6 Welded Steel Construction

E34.6.1 Welded steel construction (Metal Arc Welding) shall conform to the requirements and satisfy the testing procedures of CSA W59 and Welded Highway & Railway Bridges - AWS D1.1 of The American Welding Society & Addendum.

E34.7 Shear Stud Connectors

E34.7.1 Shear stud connectors shall conform to the requirements of ASTM A108, Grades 1015, 1018 and 1020.

E34.8 Zinc

E34.8.1 Zinc for hot dipped, galvanized coatings shall conform to the requirements of ASTM A123.

E34.9 Stainless Steel

E34.9.1 Stainless steel bolts, nuts, washers, inserts, etc. as shown on the Drawings shall conform to the requirements of ASTM A320, Class B8. Stainless steel double headed studs and stainless steel dowels as shown on the Drawings, shall conform to the requirements of ASTM A276, Type 304L (UNS S30403).

CONSTRUCTION METHODS

E34.10 Fabrication

E34.10.1 General

(a) 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.

(b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(c) 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.

(d) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(e) 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.

(f) Cutting shall be in accordance with AWS D1.1 and CSA W59.

E34.10.2 Clean Material

(a) 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.

E34.10.3 Finish

(a) 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.

E34.10.4 Machining

(a) 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.

(b) 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 .....……..ANSI 1,000

Milled ends of compression members,

milled or ground ends of stiffeners and fillers ……ANSI 500

(c) Care shall be taken that the completed surfaces are protected from damage from the time of machining until the installation in a structure.

(d) 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.

(e) 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.

(f) 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.

(g) 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.

(h) Curved Machined Surfaces - Curved surfaces shall be machined carefully in accordance with Drawings and Specifications in order to ensure correct fit of mating parts.

E34.10.5 Bending

(a) 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.

E34.10.6 Stress Relieving

(a) 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.

E34.10.7 Holes

(a) 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.

(b) 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.

(c) 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.

(d) 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.

(e) 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.

E34.10.8 Welding

(a) Specifications

i) 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.

(b) Welding Operator Qualification

i) 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.

ii) The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he 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.

(c) Welding Procedures, Specifications and Qualification

i) 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.

ii) 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.

(d) Welding Materials

i) 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.

ii) 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.

iii) 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.

iv) 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.

v) 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.

vi) 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 120○C. 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.

vii) 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.

viii) 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.

(e) Preheat and Interpass Temperature

i) The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1 and CSA W59.

(f) Welding Processes

i) 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 E70U-X	E60T-X E70T-X	F6X-XXX F7X-XXXX	A53 Gr B A500 Gr A A516Gr55,60
300W 300T 350G[d] 350W	E70XX or E60XX	E70XX	E70S-X E70U-X	E70T-X[a] or F60T-X	F7X-XXXX or F6X-XXXX	A36 A441>4" A550GrB A501 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.

(g) Distortion and Shrinkage Stresses

i) 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.

(h) Tack Welding

i) 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.

(i) Stud Shear Connectors

i) 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.

(j) Hot-Dip Galvanizing

i) Galvanizing, when called for on the Drawings, shall be done in accordance with CAN/CSA G164.

ii) 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.

E34.11 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.

E34.12 Erection

E34.12.1 Layout

(a) 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.

E34.12.2 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.

E34.12.3 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.

E34.12.4 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.

E34.12.5 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.

E34.13 Quality Control

E34.13.1 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 his own expense and to the approval of the Contract Administrator.

E34.14 Quality Assurance

E34.14.1 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.

E34.14.2 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.

E34.14.3 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.

MEASUREMENT AND PAYMENT

E34.15 Supply, Fabrication and Erection of Miscellaneous Metal

E34.15.1 The Supply, Fabrication and Erection of Miscellaneous Metal are considered incidental to the Items of Work referencing this Specification and no separate measurement or payment will be made.

E35. WELCOME TO TRANSCONA SIGNAGE

DESCRIPTION

E35.1 General

E35.1.1 This Specification covers all operations relating to the supply, fabrication and erection of stainless steel signage and related work as shown on the Drawings and as hereinafter specified, including, but not necessarily confined to the following:

(a) Supply, fabrication and installation of two (2) stainless steel signs

E35.1.2 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.

MATERIALS

E35.2 General

E35.2.1 Materials shall be in accordance with the Drawings and the Conditions of the Contract Specification E34.

E35.2.2 Materials shall be free from defects impairing strength, durability or appearance.

E35.2.3 All plate steel shall be free from scale, buckles, pits and other cosmetic defects as approved by the Contract Administrator.

E35.2.4 All exposed fastenings shall be the same material, colour and finish as the metals to which these are supplied, unless otherwise specified or called for on the Drawings.

E35.2.5 Colours for engraved logos to be of high grade polyurethane paint. Apply as per manufactures specifications.

E35.3 Submittals

E35.3.1 Submit the following according to the Conditions of the Contract Specification E3. Submittals and Shop Drawings.

E35.3.2 The Contractor shall submit design and Shop Drawings for review before commencing fabrication. Design drawings shall show layout of engraved logo on sign face and shall be signed by Contract Administrator prior to manufacture. Shop Drawings shall show fabrication method, finish, anchoring methods, layout method, installation method, and shall be as specified or as approved by the Contract Administrator.

E35.3.3 Shop Drawings shall show fabrication method, finish, lettering and logo details, anchoring methods, layout method, installation method, and shall be as specified or as approved by the Contract Administrator.

E35.3.4 AutoCAD files of the “Welcome to Transcona” signage drawings are available upon written request to the Contract Administrator.

CONSRUCTION METHODS

E35.4 Workmanship

E35.4.1 Proportion items in accordance with AREMA. Items shall support loads recommended by the Code unless specific loads are indicated on the Drawings.

E35.4.2 Fabricate work to shape and size with sharp lines, angles and smooth surfaces. Connections shall be securely bolted. Bolts and brackets shall be provided so that the work can be assembled in a neat and efficient manner.

E35.4.3 Exposed ends and edges of metal shall be smooth. Joints exposed to the weather shall be formed to exclude water or to drain.

E35.4.4 Prior to producing drawings or proceeding with shop fabrication, take all necessary field measurements to verify dimensions or calculations from Drawings.

E35.4.5 Fabricate work in strict accordance with Shop Drawings, and in general to details, sizes, materials shown on drawings and specified herein.

E35.4.6 Material intended for use in the various assemblies shall be straight, clean, sharply defined profiles, assembled in such a way that no disfigurements will show in the finished work, or impair the strength.

E35.5 Fabrication

E35.5.1 Negative Cut Letters: Form letters by cutting from solid sheet material of thickness specified. Produce characters with smooth flat faces, sharp corners, precisely formed lines and profiles, free from pits, scale, sand holes and other defects. Supply anchoring devices on reverse side of sign as indicated on Drawings.

E35.5.2 Engraved logos: Produce engraved logos with lasers, or approved equal in accordance with B8, with smooth flat faces, sharp corners, precisely formed lines and profiles, free from pits, scale, sand holes and other defects. Engraved and painted logos to match CN and Transcona BIZ logos as approved by the Contract Administrator. Logo details and colour to be provided by CN and Transcona BIZ.

E35.5.3 Exposed stainless steel to be a brushed finish.

E35.5.4 350A steel backing plate installed behind the negative cut letters to be painted flat black in accordance with E31. Backing plate and connections to be supplied in accordance with E30.

E35.5.5 Fabrication shall be in accordance with Section E34 unless specified otherwise within Section E35.

E35.6 Quality Control

E35.6.1 All workmanship and all material furnished and supplied under this Section 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 which are not in accordance with the requirements of this Section.

E35.7 Installation

E35.7.1 Install signs level, plumb, and at the height indicated with sign surfaces free from distortion or other defects in appearance.

E35.7.2 After installation, clean soiled sign surfaces. Protect units from damage until acceptance by the owner.

E35.7.3 Installations shall be in accordance with E30 and E34 unless specified otherwise within E35.

MEASUREMENT AND PAYMENT

E35.8 Welcome to Transcona signs will be measured on a unit basis and paid for at the Contract Unit Price per each for the "Welcome to Transcona Signage", 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.

E36. CHAIN LINK FENCING

DESCRIPTION

E36.1 General

E36.1.1 The Work covered under this item shall include all operations related to supply and installation of new chain link fencing including the boring of holes and grouting of poles for installation.

E36.1.2 The Work to be done by the Contractor under this Section shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of the Work as hereinafter specified.

MATERIALS

E36.2 General

E36.2.1 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.

E36.3 Fencing

E36.3.1 Chain link fencing to be supplied in accordance with CW 3550-R2

E36.3.2 Further to CW 3550-R2, bottom rails shall be used.

E36.3.3 Further to CW 3550-R2, braces shall not be used.

E36.4 Non-Shrink Cementitious Grout

E36.4.1 Non-shrink cementitious grout shall be SikaGrout 212, or equal as accepted by the Contract Administrator, in accordance with B8.

E36.4.2 Non-shrink cementitious grout shall be used for the installation of fence poles and is incidental to the Lump Sum Price for "Chain Link Fencing".

CONSTRUCTION METHODS

E36.5 Post Installations

E36.5.1 Posts shall be set in the centre of bored holes at location and depth in accordance with Drawings.

E36.5.2 Posts shall be cast in place using flowable non shrink grout as specified in E36.4.

E36.5.3 Posts shall be plumbed and set to give correct alignment. Bending of posts to give correct alignment is not acceptable.

E36.6 Chain Link Fence

E36.6.1 Install new chain link fencing to the limits shown in the Drawings in accordance with CW 3550-R2.

MEASUREMENT AND PAYMENT

E36.7 Chain Link Fence

E36.7.1 Chain Link Fencing will be measured for payment on a length basis and paid for at the Contract Unit Price per metre for "Chain Link Fence" 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.

PUMPING STATION

E37. REGULATORY REQUIREMENTS

E37.1 General

E37.1.1 If the National Building Code of Canada applies to the Work, the standards of the Work shall conform to or exceed the minimum standards of the National Building Code of Canada.

E37.2 Regulations, Standards and Codes

E37.2.1 Codes, Standards and Regulations are specified in other sections of the Specifications and the Work shall be done in accordance with those Codes, Standards and Regulations where applicable.

E37.3 Permits

E37.3.1 The Contractor is required to obtain all Permits for the Pumping Station component of this project.

E38. DRAWINGS OF RECORD

E38.1 Record During Construction

E38.1.1 The Contractor shall keep one complete set of all construction drawings on the Site.

E38.1.2 On the site set of contract drawings, the Contractor shall record any changes that are made during the actual construction of the Work. The purpose of recording these changes is to provide drawings of record at the end of the Pumping Station work. The Contractor shall be responsible for the adequacy and the reliability of the information recorded on the Drawings of Record

E38.1.3 At the completion of Pumping Station construction, the Contractor shall turn over the set of construction drawings that have been marked up with changes during the course of work to the Contract Administrator to permit the Contract Administrator to prepare the Drawings of Record of the Work.

E39. MATERIAL AND INSTALLATION

E39.1 General

E39.1.1 This Specification covers all operations relating to material and installation.

E39.1.2 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.

E39.2 Quality

E39.2.1 Material and Product supplied and installed shall be new. Material and Product supplied shall conform to these Specifications and to specified standards.

E39.2.2 Workmanship shall be the best quality, executed by workmen experienced and skilled in their respective trades

E39.2.3 Ensure full cooperation among all trades and coordination of the Work with continuous supervision.

E39.2.4 Use Material of one manufacturer for Material of the same type or classification. Do not mix different manufacturer's Material in the Work or in parts of the Work.

E39.3 Manufacturer's Instructions

E39.3.1 Unless otherwise specified, comply with the manufacturer's/supplier's instructions for Material or Product and installation methods.

E39.3.2 Notify the Contract Administrator in writing of any conflict between these Contract Specifications and the instructions of the manufacturer/supplier.

E39.4 Fastenings

E39.4.1 Provide metal fastenings and accessories in the same texture, Color and finish as the base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use noncorrosive fasteners, anchors and spacers for securing exterior work, or work that may be located in a corrosive atmosphere.

E39.4.2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage.

E39.4.3 Space fastening evenly and lay out neatly.

E39.5 Delivery and Storage

E39.5.1 Deliver, store and maintain packaged Material and Product with manufacturer's seals and labels intact.

E39.5.2 Prevent damage and soiling of Material and Product

E39.5.3 Store Material and Product in accordance with instructions of the manufacturer/supplier

E39.5.4 Provide suitable area or buildings where storage is weatherproof, if dry area are recommended by the manufacturer/supplier

E39.5.5 Material shall have name plates displaying Material data and serial numbers

E40. COORDINATION OF SECTIONS/TRADES

E40.1 General

E40.1.1 This Specification covers all operations relating to the co-ordination of the sections/trades.

E40.1.2 Although the Specifications set forth the Work of various trades under separate Sections or Clauses, it is not intended that the Work of that trade is limited to or includes all Work set forth in that particular Section or Clause. The Contractor shall delegate the extent of the Work to be done by the various trades and shall coordinate execution of the Work by all trades.

E40.1.3 Neither the Contract Administrator nor the City will be an arbitrator to establish limits of any agreements between the Contractor and his Sub-contractors.

E40.2 Mechanical, Electrical Process and Instrumentation and Controls Coordination

E40.2.1 The Contractor shall examine the electrical, HVAC, plumbing, sub structure, super structure, process and instrumentation and controls Drawings before beginning the Work and report to the Contract Administrator any discrepancies or interferences.

E40.2.2 Electrical, HVAC, plumbing and process mechanical system layouts shown on the Drawings may be diagrammatic and locations of outlets, fittings and equipment are

approximate. Exact routing of conduits, wiring, pipes and tables shall be determined and coordinated by the Contractor to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

E40.2.3 Obtain the Contract Administrator's approval for locations of outlets, fittings and equipment.

E40.3 Cutting and Patching

E40.3.1 The Contractor shall do all cutting, fitting, or patching of the Work that may be required to make its several parts come together properly and fit it to receive or be received by work of the Contract.

E40.3.2 Any cost caused by cutting and patching due to ill-timed work shall be borne by the Contractor.

E40.3.3 The Contractor shall not endanger any adjacent property or portion of the Work by cutting, digging or any other method, and shall be responsible for any damages caused by him.

E40.3.4 Coordinate the Work to minimize the amount of cutting and patching required.

E40.3.5 Do no cutting that may impair the strength of structures. Obtain the Contract Administrator’s approval before cutting, boring or sleeving load-bearing members.

E40.3.6 Make cuts clean and smooth and make patches equivalent to new work. Provide openings, holes and sleeves as required for process mechanical, building mechanical, electrical and all other components of the Work. Provide openings in pre-cast work and cast-in-place work.

E40.3.7 Drill or field cut smaller openings or holes and cast openings larger than 100 mm diameter.

E40.4 Concealment

E40.4.1 Conceal pipes, ducts, conduits within walls and ceilings of finished areas, as required by the Contract.

E41. CONSTRUCTION FACILITIES

E41.1 General

E41.1.1 This Specification covers all operations relating to the construction facilities.

E41.1.2 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.

E41.2 Temporary Utilities

E41.2.1 The Contractor shall be responsible for the cost of all temporary utilities.

E41.2.2 Natural Gas, Gasoline and Other Fuels

(a) Provide and pay all costs for natural gas, gasoline and other fuels required for the performance of the Work, in accordance with governing regulations and ordinances, and the Contract.

(b) Furnish and install all necessary temporary piping and upon completion of the Work remove all such temporary piping.

E41.2.3 Water

(a) See Section E15. – Water Obtained from the City regarding use of City water.

(b) Furnish and install all necessary temporary piping and upon completion of the Work remove all such temporary piping.

E41.2.4 Electricity and Lighting

(a) Provide and pay all costs for electricity and artificial lighting required for the performance of the Work, in accordance with governing regulations and ordinances, and the Contract.

(b) Furnish and install all necessary temporary wiring, distribution boxes, panels, etc., and upon completion of the Work, remove all such temporary installations.

E41.2.5 Heating and Ventilation

(a) Provide and pay all costs for heating and ventilating, coverings, and enclosures as necessary to protect and perform the Work.

(b) Furnish and install all necessary temporary equipment, piping, wiring, ducting, and other materials to perform the Work and upon completion of the Work, remove all such temporary equipment.

(c) Temporary heating and ventilating shall be in accordance with all governing regulations and ordinances, and the Contract.

(d) Temporary heating and ventilating shall be provided to:

i) Facilitate progress of the Work
ii) Protect the Work and Product and Material against dampness
iii) Prevent moisture condensation on surfaces
iv) Provide an atmosphere for curing Material as required
v) Provide adequate ventilation to meet safety regulations
vi) Prevent hazardous accumulation of dust, fumes, mist, vapours or gases in areas occupied during construction
vii) Ventilate storage spaces containing hazardous or volatile materials.

E41.2.6 Fire Protection

(a) Provide and pay all costs for adequate fire protection of the Work and adjacent property.

(b) Furnish and install temporary extinguishers, hydrants and other equipment, and upon completion of the Work remove all such temporary equipment.

E41.3 Construction Aids

E41.3.1 Temporary Plant

(a) Provide, arrange for, maintain and pay for all temporary items such as, but not limited to, stairs, ladders, scaffolding, ramps, transportation of labour and material, runways, chutes, hoists, elevators, tools, templates, as required for the completion of the Work.

(b) The location of such items shall be such as to prevent inference with, marking of, or damages to any portion of the Work.

(c) All such items shall conform to all applicable national and local ordinances regulating safety and to the National Building Code of Canada, and to the requirements of the Contract.

E41.3.2 Temporary Enclosures

(a) Furnish, install and maintain for the duration of construction all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms and other temporary construction necessary for proper completion of the Work in compliance with all pertinent safety and other regulations.

(b) During the construction of Plessis Underpass Pumping Station, a temporary chain link fence 1.8 m in height shall be erected around the perimeter of the Work. The Contractor shall be responsible for maintaining the chain link fence in a proper working condition. Provide a 6 m wide lockable gate. The cost of this work shall be incidental to the Contract.

E41.3.3 Falsework and Temporary Construction Supports

(a) The Contractor shall be responsible for means and methods used for the falsework and temporary construction supports.

(b) The Contract requires that the Contractor employ a qualified Registered Professional Engineer for the design of temporary works, and design in accordance with CSA S269.1.

(c) Record design calculations and drawings to show that temporary works are adequate. Provide design loads, material details, and dimensions. Sign and seal design calculations and drawings, and revisions thereto.

(d) The Contract Administrator's approval to proceed with falsework and temporary construction supports shall not relieve the Contractor of his responsibility under the Contract, The Contract Administrator's review shall be for general conformance to the intent of design and for permanent effects on the Site, or areas adjacent to the Site.

E41.3.4 Temporary Excavation

(a) The Contractor is responsible for the means and methods of making temporary excavations in order to install components of the Work.

E41.3.5 Winter Construction

(a) Special construction methods required to perform the Work in severe weather shall be the responsibility of the Contractor.

(b) Where the Specifications call for work to be performed within a given temperature range or above a minimum temperature. It shall be the Contractor's responsibility to provide all temporary enclosures and heat necessary to provide the conditions specified.

(c) Where compaction of backfill is specified, the Contractor shall perform the Work in a manner such that compaction can be achieved.

(d) Where weather conditions are such that compaction of backfill consisting of excavated materials is not possible, the Contractor shall provide unfrozen granular material for backfill, at the Contractor's expense.

E41.3.6 Access Roads

(a) Construct temporary access roads as necessary to perform the Work, and maintain temporary access roads until construction is over or until permanent access is established.

(b) Locations and drainage facilities for temporary access roads are subject to the approval of the Contract Administrator.

(c) No direct payment will be made to the Contractor for construction of temporary access roads.

E42. REQUIREMENTS FOR SHORING, DEWATERING AND EXCAVATION FOR PUMPING STATION SUB-STRUCTURE CONSTRUCTION

DESCRIPTION

E42.1 General

E42.1.1 This Specification describes the requirements for shoring, dewatering and excavation for Pumping Station construction.

E42.2 The design intent of the Shoring, Dewatering and Excavation Plan is to:

E42.2.1 Mitigate against any potential deleterious impact of large dewatering requirements from the Upper Carbonate Aquifer for the Pumping Station excavation on large groundwater users in the immediate vicinity, and

E42.2.2 Allow for reliable disposal of the discharge water during construction of the Pumping Station sub-structure, and

E42.2.3 Allow for a safe excavation that facilitates construction of the Pumping Station in accordance with the Specified requirements.

E42.3 There are a number of large groundwater users in the immediate vicinity of the proposed Pumping Station excavation that depend on the groundwater available in the Upper Carbonate Aquifer to keep their operations functioning. As a result, pumping excessive amounts of groundwater as means of lowering the piezometric head for deep excavations for the Pumping Station excavation is not feasible.

E42.4 Existing drainage in the area consists of both open channel and conventional land drainage sewers. The open channel drainage system, which includes the Dugald Drain, located on the south side of Dugald Road, is the only outlet for the large residential area and industrial area located south of the CN Redditt Subdivision tracks. The Dugald Drain's service area extends from Murdoch Road in the east, St. Boniface Road and the northern Boundary of Symington Yards in the south to Archibald Street in the west near the outlet to the Seine River. It cannot be allowed to freeze or be compromised due to the construction activities along Plessis Road. The 525 mm land drainage sewer located on the east side of the Plessis Road right-of-way also has limited discharge capacity. In addition to discharge capacity, discharge volume must be considered as a limiting constraint. The 525 mm sewer discharges to the Deep Pond Stormwater Retention Basin System (SRB 4-7) which has a finite volume available. The stormwater retention basin is lowered every fall in order to prevent the need to discharge the basin during the winter period. The volume available in the stormwater retention basin will, therefore, fluctuate depending on the conditions leading up to freeze up in the land drainage sewershed.

CONSTRUCTION METHODS

E42.5 The contractor shall develop a shoring, dewatering and excavation plan as a formal Shop Drawing Submission in accordance with the requirements noted herein.

E42.6 The following design constraints exist for the proposed shoring, dewatering and excavation plan:

E42.6.1 The Upper Carbonate Aquifer is encountered in a fractured bedrock layer interfacing with clay and till at roughly 214.0 to 215.0 m at the Pumping Station location. The geotechnical report is found in Appendix A. The bottom of the Pumping Station excavation is estimated to be at approximately 219.75 m.

E42.6.2 The maximum allowed dewatering flow rate from the Upper Carbonate Aquifer shall not exceed 9.46 L/s (150 USGPM) for periods of operation longer than 5 minutes. This flow rate is based on maintaining the normal fluctuations in the groundwater piezometric heads that have been observed to date and the storage volume that will likely be available in the Deep Pond SRB during construction of the Pumping Station substructure. Discharge of the excess groundwater shall be to the existing 525 mm land drainage sewer located on the east side of the Plessis Road right-of-way pending City approvals.

E42.6.3 The wet well floor elevation of 220.75 m is based on providing sufficient suction head on the proposed submersible pumps under various design storm conditions. This suction head is dependent on the incoming 1050 mm land drainage sewer invert of 222.84 m.

E42.6.4 The incoming land drainage sewer has been designed using the minimum cover allowed for land drainage sewers along the roadway of the underpass (i.e. 1.5 m depth of cover) while still meeting the required hydraulic requirements and design levels of service for the land drainage system.

E42.6.5 Hydrogeological investigations in the Upper Carbonate Aquifer were undertaken by W. L. Gibbons and Associates. The report is available in in Appendix F. The recently observed groundwater conditions in the fractured bedrock has piezometric head of approximately 222.0 to 223.1 m.

E42.6.6 Competent bedrock underlying the fractured bedrock layer is located approximately at 211 to 212 m. See the test hole logs in Appendix A for more information.

E42.6.7 The 200 mm watermain located on the west side of the Plessis Road right-of-way installed as a part of Contract 1 can be temporarily relocated. Shutdown of this watermain cannot exceed 24 hours.

E42.6.8 The 450 mm wastewater sewer, MTS, Shaw and Manitoba Hydro infrastructure located west of the 200 mm watermain cannot be temporarily or permanently relocated.

E42.6.9 Two 200 mm diameter wells have been installed in the Upper Carbonate Aquifer proximate to the proposed Pumping Station and are available for use as either monitoring wells or pumping wells. If the wells need to be abandoned to accommodate the Contractors works, the wells are to be abandoned in accordance with provincial requirements and at the Contractors expense.

E42.6.10 The City of Winnipeg is in the process of obtaining a Water Rights License from the Province of Manitoba authorizing any groundwater pumping that may be required. The Contractor is required to comply with the terms and conditions associated with that license.

E42.6.11 Piezometric heads within the sealed shoring system shall not drop below 219.0 m.

E42.7 Submittals Before Starting the Work

E42.7.1 The Contractor shall provide the Contract Administrator a Shoring, Dewatering and Excavation Plan for the Pumping Station Construction that demonstrates compliance with the technical requirements outlined herein within fourteen (14) business days after the Award of Contract as per D19.4

E42.7.2 The Shoring, Dewatering, and Excavation Plan shall be submitted as a Shop Drawing Submission in accordance with CW1110, CN guidelines for Design of Rail Structures, CN Guidelines for Temporary Shoring, AREMA 2013 and sealed and signed by a Professional Engineer licensed to practice in the Province of Manitoba. Once approved by the Contract Administrator, the shoring drawings and design will be submitted to CN for final approval. The Plan shall include the following:

(a) A written methodology plan demonstrating the ability of the system to meet the stated design intent, including:

i) Details of the shoring system to be embedded into competent limestone bedrock below the Upper Carbonate Aquifer and its key design features to meet the overall design intent. The shoring system is to isolate the base of the excavation from the aquifer as well as its ability to act as a shoring system to resist all applied loads and to enable the excavation work to be carried out up to the final level without obstructions due to high ground water head.

ii) Adopted methodology should ensure that the water head within the Upper Carbonate Aquifer outside the excavation area is not adversely affected or due to the execution of shoring work.

iii) Methods employed to seal joints and/or gaps in the shoring system to reduce water inflow into the excavation to acceptable and controlled levels.

iv) Methods to be used to control and/or mitigate the release of turbid groundwater arising from the installation of the shoring system and other construction activities related to the Pumping Station construction.

v) Methods to be used to confirm that the interior of the excavation is sealed from the aquifer prior to excavation using a pump test, piezometers, and other relevant verification approaches.

vi) Data to support that durability and reliability of the dewatering system to demonstrate that it is capable of operating without interruption for the duration that the excavation is required to be open.

vii) Confirmation and supporting rationale and/or data to demonstrate that dewatering rates from the aquifer can be limited to the prescribed discharge levels.

viii) All other relevant supporting data, calculations, and descriptions with supporting references and rationale to demonstrate that the plan is compliant with the stated design intent herein.

ix) Methods to be used to confirm that the lateral deflection of the shoring system is within acceptable limits during the excavation work using slope inclinometers around the shoring.

(b) An execution plan presented in the form and annotated sketch forms and/or drawings demonstrating:

i) Details of the shoring and dewatering systems,

ii) Sequencing of their installation,

iii) Monitoring requirements to confirm that the system is performing in its intended manner including the frequency of monitoring, and parameters and locations to be monitored.

iv) Maintenance requirements for the installed components to ensure it meets the durability and reliability requirements for duration that the excavation is required to remain open.

E42.8 Submittals During the Work

E42.8.1 The Professional Engineer who designed the shoring system shall inspect the shoring system during construction, and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.

E42.8.2 Monitoring

(a) Shoring system at the Pumping Station:

i) The maximum lateral deflection allowance shall be 65mm; if the measured deflection exceeds this limit then the Contractor shall terminate the excavation work immediately around this area to allow for further inspection and analysis by the Contract Administrator.

ii) The Contractor shall propose a method to mitigate the lateral deflection and submit to the Contract Administrator for approval. No excavation work around the shoring system shall be allowed before obtaining an official approval from the Contract Administrator.

(b) The Contractor shall take all the necessary measures to protect monitoring devices.

(c) The Contractor shall be responsible for any damage to the monitoring devices during the course of the Works. If any monitoring devices are damaged, the Contractor shall report to the Contract Administrator immediately and pay the cost of supply and installation of new devices as per the Contract Administrator's direction.

MEASUREMENT AND PAYMENT

E42.9 Sub-Structure Excavation, Shoring and Dewatering

E42.9.1 Structural Excavation, Shoring and Dewatering shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for ""Structural Excavation, Shoring and Dewatering", 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.

E43. ROCK-SOCKETED CAISSON FOUNDATION

DESCRIPTION

E43.1 Construction of the rock socketed caisson foundation to be completed in accordance with the Drawings and the specifications outlined in E24. Backfill of the wet well and substructure to be in accordance with the Drawings and the relevant Specifications outlined in E23.

MEASUREMENT AND PAYMENT

E43.2 Rock Socketed Caisson Foundation

E43.2.1 Rock Socketed Caisson Foundation will be measured and paid for in accordance with E24.

E44. SUB STRUCTURE

DESCRIPTION

E44.1 Sub Structure shall include all Work related to the construction of the cast in place concrete Pumping Station sub structure as shown on the Drawings and described herein including formwork, reinforcement, concrete, water stop, concrete accessories, concrete testing, backfilling and miscellaneous items.

E44.2 Construction of cast in place concrete wet well and substructure to be completed in accordance with the Drawings and the relevant Specifications outlined in E25 and E26.

E44.3 Construction of the monorail located in the sub structure is to be completed in accordance with the Drawings and Division 41 of the National Master Specification (NMS) format listed herein.

MEASUREMENT AND PAYMENT

E44.4 Sub Structure

E44.4.1 Sub Structure shall not be measured. This Item of Work will paid for at the Contract Lump Sum Price for “Sub Structure”, 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.

E45. SUPER STRUCTURE

DESCRIPTION

E45.1 Super Structure shall include all work related to the construction of the building super structure as shown on the Drawings and described herein. Included as a part of this work is masonry, metals, wood products, thermal and moisture protection, doors, finishes and miscellaneous items. Include all relevant work whether identified, implied, or required to perform the Work and provide a complete and functional Pumping Station building.

E45.2 Construction of the Super Structure is to be completed in accordance with the Drawings and Divisions 04, 05, 06, 07, 08 and 09 of the National Master Specification (NMS) format listed herein.

MEASUREMENT AND PAYMENT

E45.3 Super Structure

E45.3.1 Super Structure shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “Super Structure”, 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.

E46. PROCESS MECHANICAL SYSTEMS

DESCRIPTION

E46.1 Process Mechanical Systems shall include all work described herein and as shown on the Drawings except for supply of the vertical submersible pumps. Included as a part of this work are submersible solids handling pumps, wet well accessories, process mechanical piping, gates, valves, electric valve actuators, testing and miscellaneous items. Include all relevant work whether identified, implied, or required to perform the Work and provide a complete and functional process mechanical system.

E46.2 Supply of Vertical Submersible Pumps shall include the supply and storage of the vertical submersible pumps prior to installation.

E46.3 Process Mechanical System works is to be completed in accordance with the Drawings and Divisions 40, Sections 40 05 90.01 to 40 23 19.01, and Division 43 of the National Master Specification (NMS) format listed herein.

MEASUREMENT AND PAYMENT

E46.4 Process Mechanical Systems

E46.4.1 Process Mechanical Systems shall not be measured. This Item of Work will be paid for at the Contract Unit Price for "Process Mechanical 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.

E46.5 Supply of Vertical Submersible Pumps

E46.5.1 Supply of Vertical Submersible Pumps will be measured on a Unit basis and paid for at the Contract Unit Price per each for "Supply of Vertical Submersible Pumps", 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.

E47. PLUMBING AND HVAC MECHANICAL SYSTEMS

DESCRIPTION

E47.1 Plumbing and HVAC Mechanical Systems shall include all work identified herein and as shown on the Drawings. Included as a part of this work is domestic plumbing water piping, valves, air handling units, exhaust fans, unit heaters, louvers, dampers, ducting, duct insulation and coverings, vibration isolation, testing and miscellaneous items. Include all relevant work whether identified, implied, or required to perform the Work and provide a complete and functional HVAC and domestic plumbing system.

E47.2 Plumbing and HVAC Mechanical works is to be completed in accordance with the Drawings and Divisions 22 and 23 of the National Master Specification (NMS) format listed herein.

MEASUREMENT AND PAYMENT

E47.3 Plumbing and HVAC Mechanical Systems

E47.3.1 Plumbing and HVAC Mechanical Systems shall not be measured. This Item of Work will be paid at the Contract Lump Sum Price for "Plumbing and HVAC Mechanical 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.

E48. ELECTRICAL SYSTEMS

DESCRIPTION

E48.1 Electrical Systems shall include all work identified herein, except for the supply of the natural gas generator, and as shown on the Drawings. Included as a part of this work is the motor control center, panels, conduit, wire, cable, box connectors, fastenings and support, wiring devices, switches, grounding, transformers, panel boards, circuit breakers, surge suppressors, terminations, mounting and wiring of the emergency generator transfer switch, lighting, testing and miscellaneous items. Include all relevant work whether identified, implied, or required to perform the Work and provide a complete and functional electrical system.

E48.2 Supply of Natural Gas Generator shall include the supply and storage of the natural gas generator prior to installation.

E48.3 Electrical works is to be completed in accordance with the Drawings and Division 26 of the National Master Specification (NMS) format listed herein.

MEASUREMENT AND PAYMENT

E48.4 Electrical Systems

E48.4.1 Electrical Systems shall not be measured. This Item of Word will be paid for at the Contract Lump Sum Price for "Electrical 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.

E48.5 Supply of Natural Gas Generator

E48.5.1 Supply of Natural Gas Generator will be measured on a Unit basis and paid for at the Contract Unit Price per each for "Supply of Natural Gas Generator", 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.

E49. INSTRUMENTATION AND CONTROL SYSTEMS

DESCRIPTION

E49.1 Instrumentation and Control Systems works is to be completed in accordance with the Drawings and Division 40, Section 40 90 00 to 40 96 50 of the National Master Specification (NMS) format listed herein.

E49.2 Instrumentation and Control Systems" shall include all work identified herein and as shown on the Drawings. Included as a part of this work is the programmable logic controller, SCADA equipment, telephone line, ultrasonic level sensors, programming, testing and miscellaneous items. Include all relevant work whether identified, implied, or required to perform the Work and provide a complete and functional instrumentation and control system.

MEASUREMENT AND PAYMENT

E49.3 Instrumentation and Control Systems

E49.3.1 Instrumentation and Control Systems shall not be measured. The Item of Work will be paid for at the Contract Lump Sum Price for "Instrumentation and Control 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.

E50. COMMISSIONING

E50.1 General

E50.1.1 This Specification covers all operations relating to the commissioning of the Pump Station.

E50.1.2 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.

E50.1.3 The Contractor shall provide, commission, and turn over to the City a complete operating Pump Station and associated works.

E50.1.4 For commissioning purposes the term Pump Station shall mean the Work of this Contract entirely.

E50.1.5 Testing and commissioning shall normally proceed in the following steps:

(a) Hydrostatically test the wet well for concrete integrity.

(b) Test pump performance using draw-down testing.

(c) Commission the emergency generator.

(d) Commission all HVAC systems.

(e) Test all other individual items and items forming sub-systems, ready for operation.

(f) Commission the Work of this Contract entirely.

(g) Turn over the Work to the City.

E50.1.6 Testing and commissioning shall be performed by the Contractor, in the presence of the Contract Administrator.

E50.2 Preparation

E50.2.1 Establish a written detailed procedure and schedule and submit to the Contract Administrator at least 2 weeks in advance.

E50.2.2 Follow the procedure and schedule unless otherwise agreed.

E50.2.3 Inspect all Material and Product to ensure that the Work is complete, that Material and Product are in place and secure, and that the recommendations of the manufacturer/supplier have been complied with for lubrication, cooling fluids and all other requirements.

E50.2.4 Inspect and clean all pipe, vessels and equipment, and all electrical connections.

E50.3 Personnel

E50.3.1 Provide competent, experienced, factory trained technical personnel to supervise the installation, inspection, testing and commissioning of Material supplied and installed under this Contract.

E50.3.2 The Contractor shall provide and pay for all such personnel, regardless of the length of time required to commission the Work.

E50.3.3 Use of the Contractor's personnel during commissioning of mechanical, electrical, process, and instrumentation & controls work will not be accepted in lieu of factory trained personnel.

E50.4 Testing Individual Equipment

E50.4.1 Every individual item of equipment shall be tested by itself and in combination with related items to ensure that the item and the subsystem are in perfect operating condition, comply with specified requirements and are ready for operation.

E50.4.2 All testing, checking, calibration, adjustments, making of connections, setting, lubrication and other requirements shall be carried out and a brief report submitted to the Contract Administrator for each item tested individually.

E50.4.3 Other sections of the Specifications may contain specific testing, cleaning, disinfecting, balancing and operation requirements that are to be followed in conjunction with this Section.

E50.4.4 Inspection and testing shall include, but shall not be limited to:

(a) soundness - without damaged parts,

(b) completeness in all details as specified,

(c) correctness of setting, alignment and arrangements of parts,

(d) adequacy and correctness of packing, sealing and lubrication.

E50.5 Commissioning

E50.5.1 Commissioning shall include the Contractor's operation of the facilities as a complete system for one (1) calendar day, followed by the City's staff operating the facilities under the guidance of the Contractor for one (1) additional calendar day. These are minimum times based upon demonstration of satisfactory operation.

E50.5.2 During the Commissioning period the Contractor shall appoint one qualified person to lead the commissioning group of Contractor's personnel, Subcontractor's personnel and manufacturer's / supplier's representatives.

E50.5.3 Operation of any part of an existing system shall be performed by the City only.

E50.5.4 The Contract Administrator may order changes in procedure, operation methods or may take whatever actions are necessary to ensure correct commissioning.

E50.5.5 During the Commissioning period, the Contractor shall demonstrate that the operation of the facility as a whole, as well as all components, is correct and in accordance with the Contract requirements.

E50.5.6 All components shall be demonstrated over the entire range of operation specified, including variations in flow, pressures, speeds and controls.

E50.5.7 All malfunctions, alarms, safety devices, interlocks, and annunciation shall be demonstrated by simulation of malfunctions as necessary.

E50.5.8 During the initial commissioning period, only the Contractor shall operate the systems installed in this Contract, and the City's personnel shall observe and receive operation instructions.

E50.5.9 During the second period of the commissioning the City's personnel will operate the facility under the guidance and supervision of the Contractor. At the end of the commissioning period the City will assume complete responsibility for operation of the facility.

E50.6 Installation Assistance and Inspections

E50.6.1 The Contractor shall coordinate with the suppliers for the provision of the supplier services for all equipment specified herein. The Contractor shall coordinate and expedite the provision of these field services for the pump, gen-set, MCC and HVAC equipment and include all the related costs in the Bid Submission.

E50.6.2 The Contractor shall ensure that skilled servicemen from the suppliers of equipment have instructed the Contractor in the proper installation of the equipment and that the Contractor has obtained and understands all necessary written installation instructions.

E50.6.3 Toward the end of the installation period, after informing the Contract Administrator, notify the supplier to send his skilled servicemen to check over the completed installation of equipment specified. The servicemen shall make a detailed check of the installation including alignment, belt tension, bolt tensions, running clearances, lubrication and workmanship and all other items as required to ensure proper operation of the equipment. Promptly remedy any defects to the satisfaction of the supplier's skilled servicemen. The equipment shall then be run and tested in the presence of the serviceman, the Contractor and the Contract Administrator.

E50.6.4 The supplier's skilled serviceman shall then certify that the installation is satisfactory.

E50.7 Equipment Start-Up Assistance

E50.7.1 Notify the Contract Administrator fourteen (14) calendar days ahead of the date when startup is to take place. Have the supplier send a skilled serviceman to the Site. The visit to Site may be concurrent with the check of satisfactory installation if mutually agreed by the supplier, the Contractor and the Contract Administrator.

E50.7.2 On his start-up visit the supplier's skilled serviceman shall make all necessary checks to equipment and if necessary advise the Contractor as to any further checking, flushing or cleaning required prior to confirming that the equipment is ready to run.

E50.7.3 The Contractor and the supplier's skilled representative shall then operate the equipment for at least four (4) hours to demonstrate to themselves the operation of the equipment and controls and shall take all necessary remedial steps to ensure satisfactory operation.

E50.7.4 The Contractor shall then notify the Contract Administrator of his readiness to demonstrate the operation of the equipment and the Contract Administrator shall arrange to promptly attend such demonstration together with the City's representative.

E50.7.5 The Contractor and the serviceman shall then demonstrate to the Contract Administrator's satisfaction that the equipment is properly aligned, that there is no pipe stress, etc. The Contractor shall carry out such tests as required by the Contract Administrator. All pieces of equipment shall be tested in the presence of the Contract Administrator to ascertain that the equipment conforms with the Contract requirements (i.e. pump flow tests, power draw tests, emergency generator, instruments, HVAC and other electrical systems). The results of such tests shall be recorded by the Contractor on forms whose format has been agreed to by the Contract Administrator and the completed forms, signed by the Contractor, shall be given to the Contract Administrator. The Contractor shall arrange to provide all chemicals to demonstrate satisfactory operation.

E50.7.6 Should the demonstration reveal any defects then such shall be promptly rectified by the Contractor and the demonstration of the equipment repeated to the satisfaction of the Contract Administrator. Should such repeat demonstration require a second, or subsequent visit to the Site by the Contract Administrator and / or City's representative, then the additional costs incurred shall be paid for by the Contractor. Upon satisfactory completion of this demonstration the equipment shall then be commissioned as scheduled by the Contractor and approved by the Contract Administrator.

E51. CLOSEOUT SUBMITTALS

E51.1 General

E51.1.1 This Specification covers all operations relating to the closeout submittals.

E51.2 Cleanup

E51.2.1 Maintain the working area in a clean and orderly manner as the Work progresses, and upon completion of construction, remove all waste materials, and all temporary facilities from the Site.

E51.2.2 Remove surplus or salvaged materials belonging to the Contractor from the Site.

E51.2.3 Vacuum clean interior building areas when ready for painting, and continue vacuuming as needed.

E51.2.4 Remove grease, dust, dirt, stains, labels, finger prints and other foreign materials from sight on exposed interior and exterior finished surfaces, including glass and other polished surfaces.

E51.2.5 Clean lighting reflectors, lenses and other lighting surfaces.

E51.2.6 Broom clean paved surfaces, rake clean other surfaces of ground.

E51.2.7 Remove debris and surplus materials from roof areas and accessible concealed spaces.

E51.2.8 Remove snow and ice from access to the building.

E51.3 Spare Parts

E51.3.1 Supply spare parts as specified in various parts of this Specification.

E51.3.2 In general, supply spare parts for all major wear items as recommended by the manufacturer.

E51.3.3 Deliver the spare parts to site; place and store.

E51.3.4 Receive and catalogue items. Submit inventory listings in Maintenance Manual.

E51.4 Special Tools

E51.4.1 Provide special tools to allow service of equipment during maintenance.

E51.4.2 Provide items with tags identifying their associated function and equipment.

E51.4.3 Deliver the special tools to site; place and store

E51.4.4 Receive and catalogue items. Submit inventory listings in Maintenance Manual.

E51.5 Record Documents

E51.5.1 As specified in other sections of the Specification, the Contractor is required to prepare record drawings, to provide survey notes, to supply test results and other documentation. Such information shall be turned over to the Contract Administrator before Total Performance.

E51.6 Operation Manual

E51.6.1 Prepare operation and maintenance manuals and submit four copies to the Contract Administrator before Total Performance.

E51.6.2 Operation and maintenance manuals are specified in general in this section, with regard to numbers of binders, preparation, marking, general arrangement, format and general contents. Requirements for mechanical, process equipment, electrical work and other items may be specified in other sections of the Specifications, however the general format shall be in accordance with this section.

E51.6.3 Provide the services of a qualified and experienced company to prepare manuals.

E51.6.4 Prepare sets of manuals for various divisions using identical bindings, and the same indexing system and format for all manuals.

E51.6.5 Provide 215 x 280 mm extension type catalogue binders bound with heavy weight bright blue fabric, hot stamped in silver lettering front and spine. Acropress, Cerlox or similar light weight or special hole binders are not acceptable.

E51.6.6 Letter each binder as follows:

(a) Front Face
  i) Full identification of title of project
  ii) Contract Administrator - full identification title
  iii) Design Consultants - full identification title
  iv) Contractor - full identification title
  v) Sub Contractors - full identification title

(b) Spine
  i) full identification of title of project
  ii) copy number

E51.6.7 Arrange each individual binder as follows, using colored divider tabs which shall be laminated mylar plastic and which shall be colored according to section of the manual.

E51.6.8 Each division of the manual i.e. mechanical, electrical, process equipment etc. shall be a complete manual and shall in general be in the following format with the divider tabs as noted:

(a) Tab 1.0 Title Page
  i) job name & City's name
  ii) address, telephone number and complete name of:
    - Contract Administrator
    - Contractor
    - Sub-Contractor(s)
  iii) index of all divider tabs

(b) Tab 1.1 List of drawings

(c) Tab 1.2 Description of Systems

(d) Tab 1.3 Operation of Systems

(e) Tab 1.4 Maintenance & Lubrication (information for all equipment having moving parts).

(f) Tab 1.5 List of suppliers and addresses of same

(g) Tab 2.0, 2.1 etc. – Certifications

(h) Tab 3.0, 3.1 etc. – Manufacturers data, Shop Drawings, Bulletins

E51.6.9 Provide, in addition to HVAC, plumbing, process, electrical equipment details:

(a) Guarantees and warranties showing names and addresses of manufacturer and guarantee commencement and expiry date

(b) valve lists giving numbers, types, service and location.

(c) certificates and inspection reports by the manufacturers and their representatives.

E52. GENERAL PUMPING STATION PROVISIONS

DESCRIPTION

E52.1 "General Pumping Station Provisions" shall include all work related to E37 – Regulatory Requirements, E38 – Drawings of Record, E39 – Material and Installation, E40 – Co-ordination of Sections/Trades, E41 – Construction Facilities, E50 – Commissioning, and E51 – Closeout Submittals.

MEASUREMENT AND PAYMENT

E52.2 General Pumping Station Provisions

E52.3 General Pumping Station Provisions shall not be measured. This Item of Work will be paid for at the Contract Lump Sum price for "General Pumping Station Provisions", 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.

RAIL WORKS

E53. TRACK CONSTRUCTION

DESCRIPTION

E53.1 Flag Protection of Work

E53.1.1 In addition to E17, when Contractors employees are required to perform Protecting Foreman duties they must be CN qualified and have in their possession a valid rules card. Track Protection Foreman shall be considered incidental to the project.

E53.2 Work Included

E53.2.1 Provide all labour and equipment to construct trackage as shown on the Drawings and specified in this Specification. References to CN drawings within the Specifications and Drawings will be provided to any Contractor not in possession of the latest documents.

E53.2.2 Track construction, turnout construction, ballasting, surfacing and welding shall be performed by foremen and laborers experienced in railroad track construction. Track will be constructed to the design alignment, dimensions and top of rail profile as indicated on the Drawings. Track construction consists of new trackage, turnout(s) and existing track reconfiguration in addition to removal and stockpiling of surplus material.

E53.2.3 Supply and install track material.

E53.2.4 Install railway supplied turnout panels and ties.

E53.2.5 Supply and construct railway 136 lb track complete structure on new pre-plated No. 1 treated hardwood ties.

E53.2.6 Stockpile of surplus track material in a designated location as directed by the Track Supervisor.

E53.2.7 Supply and place ballast for turnouts and track to design alignment and elevation. Includes resurfacing existing grade at switch locations, as required.

E53.2.8 Install No. 12 136 lb. turnouts with RMB frog, on new switch ties and switch stand complete with transition rails.

E53.2.9 Removal of Shoofly 136lb CWR track material.

E53.2.10 Removal of #10 136lb Turnouts.

E53.2.11 Removal and Stockpile of Ballast.

E53.2.12 Reclaiming and placing of Sub-Base material.

E53.2.13 Removal and Stockpile of crushed Sub-Base material.

E53.2.14 Removal and Stockpile of Sub-Ballast material.

E53.2.15 Removal of Culverts and Subdrains.

E53.2.16 Removal and Salvage of Chain Link Fence.

E53.2.17 Removal and Salvage of shoofly track material.

E53.2.18 Supply of a qualified Protection Foreman.

E53.2.19 Lift, line and surface turnouts and track to design alignment and elevation.

E53.2.20 Obtain permits or approvals required and pay all permits and approval fees.

E53.2.21 All other work as called for on the Drawings and/or described in the Specifications.

MATERIALS

E53.3 Mainline rail shall be new 136 lb, Jointed Track. All rail shall be control cooled, straight, and free of kinks and be in compliance with current AREMA Specifications, Chapter 4.

E53.4 Taper rail shall be minimum second hand, one spot 136 lb. All rail shall be control cooled, straight, and free of kinks and be in compliance with current AREMA Specifications, Chapter 4. Rail joints are not to be located within crossing.

E53.5 Turnout rail shall be new 136 lb. free of physical defects. All rail shall be control cooled, straight, and free of kinks and be in compliance with current AREMA Specifications, Chapter 4.

E53.6 Wood ties for mainline usage shall be new 7” x 9” x 8.5’ track ties. All ties shall be hardwood grade ties, treated with a creosote-coal tar solution to a net retention of 9.2 lbs. per cubic foot minimum for mixed hardwoods and 7 lbs. per cubic foot minimum for oak. Wood ties shall

conform to current AREMA Specifications, Chapter 30, “Ties”, for size, quality, treatment, and defects.

E53.6.1 No ties will be accepted with the following defects

(a) Broken tie – tie which is broken through.

(b) Split tie – tie split end to end for the entire depth of the tie.

(c) Split tie end – tie end split resulting in poor surface and gauge.

(d) Cut tie – tie which is rail or plate cut, or adzed to a depth of 1 inch or more.

(e) Crushed tie – tie which has the bearing surface under the rail crushed one inch or more.

(f) Spike killed tie – Condition is indicated by numerous splits at the tie end and/or loose or high spikes, wide gauge and poor alignment.

(g) Decayed tie – tie which is decayed and cannot hold spikes, gauge or surface.

(h) Damaged tie – tie which is damaged to a depth of 2 inches or more due to derailments, dragging equipment or fire.

(i) A break across the annular rings (commonly known as a "split") which is not over 8 inches long will be allowed. A split over 8” long or more than one split, or a split wider than ¼” at the face across which it occurs, will not be allowed.

E53.6.2 Crossing ties shall be new 7” x 9”x 9’ track ties. All ties shall be hardwood grade ties, treated with a creosote-coal tar solution to a net retention of 9.2 lbs. per cubic foot minimum for mixed hardwoods and 7 lbs. per cubic foot minimum for oak. Wood ties shall conform to current AREMA Specifications, Chapter 30, “Ties”, for size, quality, treatment, and defects.

E53.6.3 Turnouts are to be new 136lb #12 TS-271, and must be in accordance with the current CN Standard Plans. Secondhand turnouts, if approved, must be of acceptable quality as determined by the Contract Administrator with no mismatch between rail, points or frog.

(a) All turnouts must have new hardwood switch ties.

(b) All turnouts must be equipped with adjustable braces.

(c) Minimum 14" tie plates are to be used in turnout construction.

(d) Switch machines shall be new with connecting rods, targets, and reflective tips as required.

(e) Secondhand turnout material is not to be painted.

E53.6.4 Rail anchors shall be new or manufacturer certified refurbished, drive-on-type and of standard manufacture, as approved by the Contract Administrator, of the proper size to fit 136lb rail sections.

E53.6.5 Tie plates shall be new, and measure a minimum of 7-1/2”x14” in size on tangent and 7-1/2”x16” on curves up to 6º .Curves over 6º shall have 16” plates. All plates shall have 6 spike holes. All tie plates are to be double shoulder with 1:40 cant, free of injurious defects and foreign material, and shall conform to current AREMA Specifications for 136lb rail.

E53.6.6 Joint bars shall be new, in good condition, toeless type, free of foreign material and without injurious defects. They shall conform to current AREMA Specifications, and must be to the proper design and dimensions for the rail on which it is to be applied. 136lb joint bars shall have 6 bolt holes and measure a minimum 36” in length.

E53.6.7 Compromise bars shall be new, in good condition, toeless type, free of foreign material and without injurious defects. They shall conform to current AREMA Specifications, and must be to the proper design and dimensions for the rails on which it is to be applied. Installed bars will be painted blue.

E53.6.8 Track spikes must be new 5/8" square with reinforced throat design. All track spikes shall conform to current AREMA Specifications for High-Carbon Steel Track Spikes, Chapter 5, Part 2. Length of track spike under its head shall be 6 inches.

E53.6.9 Track bolts with nuts must be new. Bolts and nuts shall conform to current AREMA Specifications. Bolts and nuts shall be to the appropriate size for the bolt holes in the rail section with length sufficient for a full nut and spring washer and 1/4" thread exposed.

E53.6.10 New spring washers of the appropriate size to fit the track bolt used shall conform to current AREMA Specifications. Each track bolt shall receive one spring washer.

E53.6.11 Tie plugs for softwood ties shall be new, creosote treated, and shall conform to current AREMA Specifications, Chapter 30. A chemical plug is required for hardwood ties.

E53.6.12 Thermite field welding material for 136lb rail is to be as manufactured by Boutet or Orgotherm.

E53.6.13 Crossing planks shall be new softwood treated 7"x10"x20' prebored and meeting current CN standard.

E53.6.14 Crossing lag bolts shall be new hex ¾"x12" complete with ¾" flat washer.

E53.6.15 Track Panels shall be 136lb, in 39' lengths, fully anchored and shall meet track standards as outlined in this Specification.

E53.6.16 Rock ballast shall be as approved by CN. The gradation of the rock ballast is 2" minus in size with a minimal amount of fines as per CN Specification 12-20C Class 2 (Appendix D). Walking ballast shall conform to AREMA Size No. 5, and meet the quality requirements as shown in the AREMA Table No. 1 and No. 2. All ballast shall be crushed to assure abrasive edges. Frozen ballast, at time of placement, will not be accepted.

(a) Contractor shall furnish written test results to the Contract Administrator that indicates the crushed rock ballast is accordance with the limiting values referenced above.

(b) Ballast to have a minimum count of particles with one or more fractured faces of 70% on each sieve size.

(c) The percent of wear due to abrasion shall be less than 30% for the ballast per ASTM C 131 "A" Grading.

E53.7 Track Construction

E53.7.1 Contractor shall exercise care in the unloading and distribution of track material and in the construction of trackage to avoid disturbing the surface of the subballast and the seeding and mulching on the side slopes. Any damage to either the subballast surface or side slopes caused by Contractor's operations shall be repaired at Contractor's expense to the satisfaction of the Contract Administrator. The Contractor shall provide for the movement and handling of and the laying of rail in such a manner as to avoid damage to new roadbed, subballast, and rail. Care must be exercised to avoid twisting or damaging rail. During handling, Contractor shall be responsible for damage to rail to the extent that sections thereof damaged, in the opinion of the Contract Administrator, unsuitable for use in track, such rail section shall be replaced at the sole expense of the Contractor. It is entirely up to the Contract Administrator to determine if any rails or portions thereof have been damaged.

E53.8 Handling of Material

E53.8.1 Contractor shall be responsible for all track material. Contractor's responsibility begins at his loading of materials, unloading of materials to ground at site locations, continues through its placement into the track structure and until final acceptance of the track by the Contract Administrator.

E53.8.2 No additional compensation will be allowed for segregating or replacing materials of questionable quality or condition. After inspection by the Contract Administrator, the

Contractor will be advised if material in question is suitable for use. If material is rejected by Contract Administrator, the Contractor will replace the rejected material at his expense.

E53.8.3 The Contractor's responsibility for materials continues through its placement into the track structure and until final acceptance of the track by the Contract Administrator and CN. If materials are damaged, lost, or wasted through Contractor's negligence, poor workmanship or handling, Contractor shall replace said materials in kind at no additional cost.

E53.9 Execution

E53.9.1 Timber ties shall be unloaded and handled in such a manner as not to damage them, using approved handling equipment. Pulling timber ties into position with picks or shovels will not be permitted. Tie tongs shall be used for this purpose.

(a) Cross ties shall be placed at a design spacing of 20 ½" center to center except where crossing planks are to be installed they shall be placed at 19 ½" center to center. The cross ties shall be placed on the approved finished subballast, perpendicular to center line of track, with the right hand (in the direction of increasing stationing) ends of cross ties being parallel with and each end of the cross tie being the same distance from center line of track, except on curves, where cross ties are to be aligned to the inside of the curve. All rail joints/welds are to be suspended between ties.

(b) When both new and PW ties are being used only new ties shall be placed within 200 feet of any switch ties.

(c) If spikes are pulled from any timber tie, hole shall immediately be filled by driving in a treated wood tie plug the full depth of the hole in softwood ties or by injecting an approved chemical plug material in hardwood ties.

(d) Lay timber ties with heartwood face down, and if not possible to determine position of the heartwood, lay the widest surface of the timber tie down.

(e) Top surface of timber ties shall be clean and smooth to provide full bearing for tie plates. The bottom of the rail, the tie plate and the wearing surface of the timber tie shall be broom cleaned before the rail is laid.

E53.9.2 Tie plates shall be used under running rails on all track where timber ties are placed.

(a) Tie plates should be free of dirt and foreign material when installed.

(b) Care must be exercised to see that canted tie plates are applied so as to cant the rail inward.

i) Tie plates must be placed square with the rail and centered on the tie. Particular care must be given to see that the tie plate shoulders and spike heads are never under the base of the rail and that the tie plates are well seated with full even bearing on the ties and the rail is properly seated on the tie plate. After rails are in place, outside shoulder of tie plate shall be in full contact with outside edge of rail base.

(c) The same size tie plate must be used opposite one another on each cross tie. Plates from different manufacturers must not be intermixed.

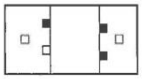
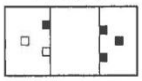
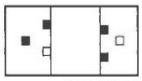
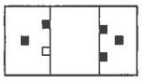
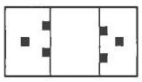
(d) Sweep off all granular material from ties prior to placement of tie plates.

(e) Sweep off all granular material from tie plates prior to placement of rail.

(f) Cutting or burning of tie plates is not permitted.

E53.9.3 Cross ties shall be spiked as per Table 1.

Table 1

No.	SPIKING PATTERN Field	Gauge	MGTs PER YEAR	DEGREE OF CURVE Tangent up to 2°	2° to 4°	4° to 6°	Greater than 6°
A			Other than Main Track	X	X	X	X
			0-20	X			
B		OR 	0-20		X	X	
			Greater than 20	X			
C			0-20				X
			Greater than 20		X	X	
D			Greater than20				X
			Turnouts Spiking pattern D will be applied to turnouts as per Figure 2 below 89				

E53.9.4 Turnouts shall be spiked with Spike Pattern D from a point 39' in front of the points to a point 39' beyond the last switch tie on the tangent and to a point 39' beyond the E.C. of the return curve.

E53.9.5 Installation of joint bars complete with tightened bolts must occur before spiking rail.

(a) Uniform track gauge must be maintained when spiking and must be checked by use of standard track gauge.

(b) The right hand rail going in the direction of increasing stationing shall be spiked to cross ties, and the opposite rail shall be brought to standard gauge of 4'-8½" measured at right angles between the rails, 5/8" below the top of rail. Gauge to be checked at every third tie by using a tested and approved track gauge. Curves shall have gauge widened in accordance with the following table:

Degree of Curve	Gauge
10 degrees or less	4'-8½"
Greater than 10 degrees	Increased 1/16 inch per degree of curvature

(c) Spikes will be driven only with a standard spike maul, sledge hammer, pneumatic or hydraulic spiking hammer or spiking machine.

(d) All spikes shall be started and driven vertically with the face of the spike in contact with the base edge of the rail and so driven as to allow 1/8 inch to 3/16 inch space between the underside of the head of the spike and the top of the base of the rail. In no case shall the spikes be overdriven or straightened while being driven. When spikes are driven by machine, work shall be closely supervised to see that they are driven with a hammer centered exactly over each spike head and drive spike vertically. Set stop on the machine to prevent overdriving.

(e) No spike shall be within 2" of the end of a joint bar. Do not strike rail directly with a maul, either on top when driving, or on side to obtain track gauge.

(f) Withdraw spikes which are incorrectly driven and fill hole by driving a treated tie plug to full depth of hole in softwood ties or by injecting an approved chemical plug material in hardwood ties. Locate replacement spike at another hole in tie plate.

E53.9.6 As required assemble temporary track rail joints before fastening rails to timber ties using joint bars with 4 track bolts and a spring washer for each bolt, first removing all dirt, loose mill scale, and rust from contact surfaces of joint bars and rails.

(a) Holes for track bolts shall only be drilled by an approved type of rail drill. Under no circumstances shall new holes be drilled between two holes already drilled.

(b) Rail joints shall be applied so that bars are not cocked between base and head of rail.

(c) If necessary to force joint bar into position, strike lower edge of bar lightly with 4 lb maul. Do not drive bolts in place. Under no circumstances shall rail be struck in web with tool or any metal object.

(d) Tighten bolts in sequence, beginning at joint center and working out to ends. Bolts to be tightened to torques required as per E53.9.9(g). If a bolt tightening machine is not used, a standard track wrench with a 42" long handle may be used.

E53.9.7 Insulated joints should be suspended, that is, the end post should not be over a tie.

(a) Plates must be used with all insulated joints on wood track ties. As shown on CN Plan TS-1206, insulated tie plates will be used on ties within 2" of the end post of an insulated joint.

(b) Rail ends where insulated joints are to be installed must conform to the following:

i) The end face shall be saw cut and bolt holes drilled to the proper size and location for the rail section.

ii) All rough edges and burrs shall be removed from the end face and bolt holes.

(c) All rust, scale, dirt or other foreign matter must be removed from the rail joint area and from the joint bars before the joint is installed.

(d) If the end post projects above the top of rail, it must be trimmed so that the top is below the top of rail, but not exceeding 1/8" below.

(e) Track near insulated joints shall be adequately anchored. Non-glued insulated joints will be considered as joints and will be anchored to the correct standard.

(f) Rail anchors must not be applied on the sides of ties adjacent to bootlegs.

(g) Rail end overflow must be removed at insulated joints by slotting in accordance with CN Plan TS-1113. The gap should be filled with silicone sealer to prevent the influx of dirt and grinding material.

E53.9.8 Compromise Joints and Rails

(a) To determine the hand of the joint, face the joint from the center of the track. When the larger rail section is on the left side of the joint, it is a left hand joint. When the larger section is on the right, it is a right hand joint.

(b) A compromise joint consists of one gauge side and one field side. The rail sections that the compromise bar will fit are indicated at each end of the bar.

(c) Compromise joint bars must not be modified from their initial design to fit a different rail section. Rail shall only change by one rail weight per bar location.

(d) Compromise joints (except 132/136) must not be installed in turnouts, or within 20' of an open deck bridge, turnout, highway crossing or railroad crossing.

(e) Compromise rails will be fully supported and tamped with the correct size tie plates under the corresponding rail section.

E53.9.9 The Contractor shall provide such equipment, tools, and materials necessary and required for turnout construction.

(a) Install turnouts in accordance with the appropriate standard plans

(b) Rail gaps at turnout panels shall be welded.

(c) Minimum 14" Tie Plates are to be used in turnout construction.

(d) All switch ties must be as laid out on standard plans, properly spaced and square to through track. Switch ties are not to be cut.

(e) The turnout stock-rail must be bent horizontally, as shown on the standard plan. Only standard carbon and 3HB rail, in 115 lb section or smaller, may be field bent with an approved bender.

For safety reasons, under no circumstances are head hardened rails or rails greater than 115 lb to be bent in the field.

(f) Ensure the switch point fits snugly against the stock rails for the entire length of the planed portion. Points will not overhang gauge plates nor be more then one inch back from front edge. Running surface of points will be ¼" above stock rail, as measured at

the location where the distance between gauge face of stock rail and gauge face of switch point when tight against the stock rail is 4½".

(g) Bolt switches, frogs and guard rails fully. Provide washers and cotter pins for bolts. Grade 8 bolts are identified by six radial lines on the head of the bolt and are to be tightened as per:

Grade 8 Bolts

Size of Bolt		Torque
Inches		Ft-Lb.
1		840
1-1/4		1675
1-3/8		2500

(h) All turnouts must be fully spiked or fastened with tie screws and clips. Spikes are to be fully driven or timber tie screws drawn down.

(i) Switch stands will be located as per instructions issued by the Contract Administrator.

(j) Switch stands must be plumb, securely spiked, bolted or lagged to the head block ties. They must also be secured with lock or keeper as supplied.

(k) Standard throw of switch points as measured at the No. 1 switch rod and at the No.5 switch rod of turnouts equipped with auxiliary throw mechanism must be set in accordance with the appropriate standard plan.

(l) Switch rods and transit clips must not contact the side of the tie or the slide plate.

(m) All switch stands must be equipped with the appropriate reflectorized target assembly (in some locations a double bladed target tip is required). Target assemblies will be properly adjusted to display green when the switch is lined for the normal route and yellow when lined for the diverging route.

(n) Install switch rod bolts and connecting rod bolts, except the bolt under the switch stand, with the nut on the upper side to permit ready inspection of the cotter pin.

(o) Install the connecting rod bolt under the switch stand with the head on the upper side.

(p) Install cotter pins on all connecting and switch rod bolts.

(q) Position the handle on the switch stand so that when the switch is in the normal position it faces away from the frog and the track, and moves in the same direction as the points when the switch is lined for the diverging route. Switch handles of rigid switch stands will be adjusted such that they cannot be placed in locking position with normal pressure when 1/8" shim placed between point and stock rail at first rod.

(r) Lubricate switch stands, switch plates, connecting rod bolts and spring frogs properly after assembly.

(s) Stock rails must be properly seated in the switch plate, have no lateral movement in the plates and switch plates have no movement on the ties.

(t) Care must be taken in adjusting braces to avoid over-driving and rotating the stock rails out of the seat of the plate.

(u) Flangeways must be clear of obstructions and not less than 1½" deep, not less than 1¾" wide and not more than 2" wide.

(v) Guard Check Gauge

i) The minimum distance from the gauge line of a frog to the guard line of its guard rail or guarding face, as measured across the track at right angles to the gauge line is 4′-6¼″.

(w) Guard Face Gauge

i) The maximum distance between guard lines as measured across the track at right angles to the gauge line is 4′-5 1/8″.

(x) Fully anchor the rail on both tracks through turnouts except where anchors will interfere with switch points. Fully anchor for 200 feet in both directions beyond the turnout.

(y) Once installed, line new turnouts for through movement and spike the switch point. Switch points shall remain spiked until inspected by the Contract Administrator.

CONSTRUCTION METHODS

E53.10 The method and equipment used by the Contractor in handling and movement and the laying of rail will be subject to the approval of the Contract Administrator.

E53.10.1 Rail shall be free of dirt and foreign material when installed

E53.10.2 Rail will only be cut square and clean by means of a rail saw with all burrs removed. Torch cut rail will not be allowed to remain in the track. When sawing rail for reuse saw cut must be made at least 4” (100 mm) from any torch mark on the rail.

E53.10.3 The Contractor will ensure that rails are laid such that gauge faces of rail are matched according to their previous position in track such that the gauge side remains the gauge side.

E53.10.4 Rail must not be struck with mauls, sledgehammers or other heavy objects.

E53.10.5 Rail of different chemistries or manufacturers shall not be mixed in any given stretch. Use compromise bars to join rails of different sections. Bars which join rails of more than one weight difference are not allowed.

E53.10.6 Jointed rail shall be laid with staggered joints. The stagger between joints of opposite rails must not be less than 12 feet. Rail joints must be kept clear of crossing planks and be a minimum of 20’ from the end of planks.

E53.10.7 Rail temperature shall be measured periodically throughout the day with at least two accurate thermometers placed on the base of the rail near the web, away from wind and out of the direct rays of the sun and away from all sources of artificial heat or cold. The thermometer shall be left in place for at least 10 minutes prior to taking a reading. A pyrometer may also be used to measure rail temperature.

(a) When using pyrometers to determine rail temperature, the pyrometer should be pointed into the shaded portion of the web of the rail. Rail temperature must be taken at intervals of approximately 150’.

E53.10.8 Expansion space between rail ends must be provided. Expansion space of the proper dimension between rail ends can be obtained through the use of shims of the correct thickness as per tables below.

Table 5-5-4. Rail End Openings for Allowance of Expansion

33-Foot Rail 160 Joints per Mile		39-Foot Rail 135 Joints per Mile		78-Foot Rail 68 Joints per Mile	
Rail Temperature Degrees F	**Expansion Inches**	**Rail Temperature Degrees F**	**Expansion Inches**	**Rail Temperature Degrees F**	**Expansion Inches**
Below –10	5/16	Below 6	5/16	Below 35	5/16
–10 to 14	1/4	6 to 25	1/4	35 to 47	1/4
15 to 34	3/16	26 to 45	3/16	48 to 60	3/16
35 to 59	1/8	46 to 65	1/8	61 to 73	1/8
60 to 85	1/16	66 to 85	1/16	74 to 85	1/16
Over 85	None	Over 85	None	Over 85	None

E53.10.9 Fibre, hardwood, or metal shims may be used to obtain the proper expansion space by bringing rail ends squarely together against the expansion shims. Expansion shims must not be removed until the rail is properly spiked, the bolts tightened and rail anchors applied.

E53.10.10 When new rail adjoins rail previously in track the old rail will be built up by welding at the joint to protect the end of the new rail.

E53.10.11 Rail is to be placed to avoid mismatch however where rail end mismatch exceeds ¼" on the top or the gauge side of a rail joint, it shall be reduced by grinding, welding or replacement of the rail.

E53.10.12 Rail ends with excessive flow will be repaired by slotting. Crushed or battered rail ends will be cut off.

E53.10.13 Nicked or gouged rail shall be rejected and replaced as determined by the Contract Administrator at the sole cost of the Contractor for any rail damage due to the Contractor's handling. This includes the cost of the replacement rail, transportation, welds, and any associated costs in the change out of the defect.

E53.10.14 Upon completion of the days work, all rail laid must be fully spiked, bolted and anchored.

E53.11 All cross ties shall be anchored to a minimum box pattern of 8 ties per 39'. The same ties on opposite rails shall be boxed.

E53.11.1 Only the proper tools or machines will be used when applying or removing anchors. The use of spike mauls is prohibited. When applying anchors by machine ensure the machine is properly adjusted.

E53.11.2 Anchors must be installed from gauge to field side of rail to insure full bearing surface against the side of the tie, bearing against the adjacent tie and remain tight on the rail. Anchors must be on the same side of the same tie on both rails. Ties are to be at right angles to the rail before applying anchors. Anchors improperly installed will be removed and applied correctly without additional charge by the Contractor. Anchors will only be removed when the rails is still in the track and done such as to prevent damage to the anchor or rail.

E53.11.3 Anchors must be fully driven; however, care must be taken to avoid over-driving as this may fracture or spread the metal, resulting in loss of holding power. Any rail anchor that is fractured or with metal spread will be rejected and replaced with another anchor at the Contractor's expense.

E53.11.4 Anchors shall be installed only to the rail section for which they are designed and shall only be the same type of anchor to any one tie.

E53.11.5 Care must be exercised in the spacing of anchors to ensure that no anchors are located on any tie under or adjacent to the ends of a rail joint bar, bond wires, insulated joints or other signal or track appliances.

E53.11.6 Anchor rail immediately after laying.

E53.11.7 Bumping posts shall have 10 ties in front of and all ties behind fully box anchored.

E53.12 CWR

E53.12.1 The Contractor shall provide such equipment, tools, and materials necessary and required for welded rail track construction.

E53.12.2 Definitions

(a) Continuous Welded Rail (CWR) is rail welded into lengths of 400 feet or more.

(b) Rail Laying Temperature (RLT) is the actual temperature at which the CWR is laid.

(c) Preferred Rail Laying Temperature (PRLT) is the target installation temperature of welded rail in a particular area. For this location the PRLT is 90 degrees F.

(d) Preferred Rail Laying Temperature Range (PRLTR) is the PRLT plus 25 degrees F.

E53.12.3 It will be necessary for the Contractor to move the welded rail strings to the exact location they are to be installed. The Contractor shall furnish such additional equipment and supplies as may be required to adequately distribute welded rail strings. Care must be taken to ensure that strings are laid such that gauge faces of rail are matched according to their previous position in track.

E53.12.4 The Contractor shall provide for the movement and handling of and the laying of welded rail strings in such a manner as to avoid damage to new roadbed, subballast, and rail. Care must be exercised to avoid twisting or damaging welded rail strings. During handling, Contractor shall be responsible for damage to welded rail strings to the extent that complete strings or sections thereof damaged, in the opinion of the Contract Administrator, unsuitable for use in track, such rail section shall be replaced at the sole expense of the Contractor. It is entirely up to the Contract Administrator to determine if any rail strings or portions thereof have been damaged. The method and equipment used by the Contractor in handling and movement and the laying of welded rail strings will be subject to the approval of the Contract Administrator.

E53.12.5 Rail shall be free of dirt and foreign material when installed. Each string of rail placed into the track structure shall be numbered at a point within ten (10) feet of each end of the rail as it is laid by the Contractor with permanent type marker prior to adjustment for temperature. Numbering shall be in accordance with Contract Administrator's instructions.

E53.12.6 The Contractor will not create any additional joints in a solid length of CWR without the authority of the Contract Administrator.

(a) CWR will not end on open deck bridges or closer than 200' from the backwall of the bridge.

E53.12.7 The welded rail strings may be delivered with torch cut ends or torch cut holes in the ends. Rail ends with torch cut holes or torched ends will have to be removed. Any removal of ends with torched areas shall be accomplished by use of a rail saw a minimum of 6" from the edge of the torch cut area. Distance is measured from the cut face to the closest edge of the torch cut or area.

E53.12.8 Rail will only be cut square and clean by means of a rail saw with all burrs removed. Torch cut rail will not be allowed to remain in the track. CWR strings shall not be cut to facilitate laying or fitting without written approval of the Contract Administrator.

E53.12.9 Upon completion of the final ballast lift and after all final lining, surfacing, and brooming has taken place, the rail shall be adjusted to arrive at the PRLT for final placement.

E53.12.10 Rail temperature shall be measured at each end of the CWR string by placing at least two rail thermometers on the base of the rail near the web, away from wind and out of the direct rays of the sun and away from all sources of artificial heat or cold.

(a) When using pyrometers to determine rail temperature, the pyrometer should be pointed into the shaded portion of the web of the rail. Rail temperature must be taken at intervals of approximately 150'.

E53.12.11 CWR will be anchored within the PRLTR without further adjustment.

E53.12.12 CWR below the PRLT must be de-stressed as soon as possible. CWR must be de-stressed using proper procedures.

(a) If rail temperature is below the minimum then approved rail heaters must be used to raise the rail temperature. Rail vibrators shall be used to prevent rail from hanging up in tie plates or tie pads. Rail heaters and rail vibrators are to be operated uniformly and continuously. CWR being adjusted by heating must be free to expand longitudinally towards it loose end. The rail anchoring on ties is to be done immediately behind the rail heaters when the rail is within the PRLTR. Where rail heaters are used, care must be exercised to prevent damage to the ties. A steel hammer must not be used for vibration as it will damage the rail.

E53.12.13 A record shall be kept by the Contractor indicating the rail and air temperatures for each piece of CWR laid. This form must be completed by the Contractor and given to the Contract Administrator on a daily basis whenever CWR is placed.

E53.12.14 To determine the proper expansion or contraction for any length of CWR for any temperature differential Contractor shall refer to Appendix C entitled "Continuous Welded Rail Thermal Expansion". The Appendix contains a table that indicates the necessary CWR expansion or contraction adjustments based on length of rail string versus the temperature differential.

E53.12.15 The ends of welded rail strings and field cuts shall be field welded in accordance with E53.14 Thermite Field Welding of this Specification.

E53.12.16 The air and rail temperature at the time of laying shall be painted on the web on the field side of the rail 6' from the end of each rail string with 4" letters. As an example: A 78° R80° will indicate and air temperature of 78° and a rail temperature of 80°. Rail that is laid at a rail temperature below 90° and heated in accordance with these instructions shall have an additional marking of H 105°. As an example: A 68° R 60° H 105° will indicate an air temperature of 68°, rail temperature of 60°, and a 105° heated rail condition. Markings on the rail should be legible and made with a permanent paint type marker. Markings from previous installation must be obliterated.

E53.12.17 Rails less than 19.5' long on curves and 12' long on tangents shall not be used except for temporary closures.

E53.12.18 Ends of welded rail strings shall be staggered by at least 19½' unless otherwise authorized in writing by the Contract Administrator. Plant welds will be staggered (to the extent possible) by at least 19½'.

E53.12.19 Nicked or gouged rail shall be rejected and replaced as determined by the Contract Administrator at the sole cost of the Contractor for any rail damage due to the Contractor's handling. This includes the cost of the replacement rail, transportation, welds, and any associated costs in the change out of the defect.

E53.12.20 Upon completion of the days work, all rail laid must be fully spiked, bolted and anchored, unless approved protective measures are in place.

E53.12.21 The use of eight hole splice bars may be approved if unable to complete thermite welds prior to cold weather.

E53.13 All cross ties shall be anchored in a box pattern on every other tie except at permanent joints not welded, adjacent to jointed rail and at turnouts & non glued insulated joints they will be anchored at every tie for a distance of 200 feet. The same ties on opposite rails shall be boxed.

E53.13.1 Only the proper tools or machines will be used when applying or removing anchors. The use of spike mauls is prohibited.

E53.13.2 Anchors must be installed from gauge to field side of rail to insure full bearing surface against the side of the tie, bearing against the adjacent tie and remain tight on the rail. Anchors must be on the same side of the same tie on both rails. Ties are to be at right angles to the rail before applying anchors. Anchors improperly installed will be removed and applied correctly without additional charge by the Contractor. Anchors will only be removed when the rails is still in the track.

E53.13.3 Anchors must be fully driven; however, care must be taken to avoid over-driving as this may fracture or spread the metal, resulting in loss of holding power. Any rail anchor that is fractured or with metal spread will be rejected and replaced with another anchor at the Contractor's expense.

E53.13.4 Anchors shall be installed only after the track has been raised, lined, and ties re-spaced, following all ballast operations and de-stressing of the welded rail.

E53.13.5 Care must be exercised in the spacing of anchors to ensure that no anchors are located on any tie under or adjacent to the ends of a rail joint bar or thermite weld.

E53.14 Thermite Field Welding

E53.14.1 General

(a) All rail joints between CWR strings and transition rail shall be thermite field welded.

(b) Field welds should be made at the time of rail laying regardless of temperature. When the field welding of a rail joint cannot be completed, each rail must be bolted with at least two bolts on each side of the joint before the track is placed in temporary service (four bolts per joint). The use of eight hole splice bars may be approved if unable to complete thermite welds prior to cold weather.

(c) Holes for complete bolting of cut rails shall be drilled by an approved type of rail drill. Under no circumstances shall new holes be drilled between two holes already drilled. Cutting rails or drilling holes in cut rails by means of acetylene or electric torch will not be permitted.

E53.14.2 Execution

(a) All thermite field welding shall be supervised and performed by an experienced rail welding supervisor and welder certified by the manufacturer of the welding equipment.

(b) Contractor shall inform the Contract Administrator daily of the location of completed welds in order for the Contract Administrator to arrange for testing and inspection. A record shall be kept by the Contractor for each field weld made during new track construction and copied to the Contract Administrator.

(c) All equipment and material required in the production of thermite welds shall be furnished by the Contractor. Thermite welding materials and equipment shall be as manufactured by Boutet or Orgotherm.

(d) The thermite welding method and procedure shall conform to current AREMA Specification Chapter 4 and with the instructions from the welding kit manufacturer (Boutet or Orgotherm) and as specified herein. Boutet or Orgotherm self-preheating weld kits shall be applied in strict accordance with manufacturer instructions, these Specifications, and to the satisfaction of the Contract Administrator.

(e) Winter thermite welding. Hot thermite weld material has the potential to become explosive whenever it comes in contact with moisture. Under winter conditions, the source of moisture may be in the form of snow and/or frost in the ballast. It is imperative that manufacturers' procedures for welding be followed at all times. In

addition, the following precautions MUST be taken when thermite welding in the presence of snow and/or frost.

In no case, shall thermite welding be performed when the temperature is below OºF (-18°C).

i) A minimum of a 10' radius must be cleared of snow around the weld area. When this in not practical due to embankment constraints, snow must be cleared to at least the edge of the ballast section.

ii) A hydraulic rail puller MUST be used on all closure welds.

iii) Rail pullers will not be removed until the weld has cooled below 700°F (389°C).

iv) It is recommended to install an approved drip pan with dry sand under the weld area to prevent any excess molten metal from contacting any moisture that may be present. It may be necessary to heat the ballast with a torch in order to facilitate removal.

v) After igniting the charge ensure everyone is clear of the weld area by at least 40 feet and remains in the clear until the reaction and pour are complete.

vi) All preheat and tear down times must be strictly adhered to. Note, 5 minutes is the minimum time required before the removal of slag pans, crucible and normal demolding begins.

vii) A dry location must be secured to place the waste material. (it is recommended to use a steel drum or rack on back of a truck for disposal of the weld waste).

viii) To prevent rapid cool down an approved cooling blanket or cooling box MUST be used. The weld must be covered immediately after hot grinding and remain covered until the weld has cooled below 400°F (222°C).

(f) Wearing of all protective clothing and safety equipment is required during welding operations.

(g) Prior to welding, rail must be visually examined for physical defects and must meet the criteria within this Specification for alignment and wear. Any rail not meeting the criteria must be reported to the Contract Administrator immediately.

(h) Thermite welds shall be located as close as possible to the center of tie cribs. The weld shall not be closer then 4” to the edge of the tie and in no case shall a weld be situated over a tie plate. Contractor shall re-space ties as necessary to prevent a weld from sitting on a tie. Field welded joints are to be centered between ties.

i) Contractor shall tamp and dress track, as necessary, to provide firm support at the weld.

ii) Contractor shall plug with the appropriate plug type for the tie and re-drive all necessary spikes.

iii) Contractor shall re-apply and adjust anchors as necessary to conform to specified anchor pattern.

(i) No holes closer than 6” from the weld will be permitted in the rail. Distance is measured from the cut face to the closest edge of the hole.

(j) Thermite welds will not be made within 6’ of another field weld or within 3’ of a plant weld without written approval by the Contract Administrator.

(k) Welding gaps for thermite welds shall be 1” except where approved wide gap welds are used.

(l) All rail ends shall be saw cut. The cut must be square and perpendicular to the rail axis, with a variation not exceeding 0.03” and all scale, rust and burrs must be removed.

(m) Overflow on rails shall be ground off for 2” beyond the mold area.

(n) Vertical rail end alignment shall be made along the running surface of the rails, such that a flat running surface will result on cool down. Any difference in height of rails shall be in the vertical base offset.

(o) Vertical misalignment of rail ends on the base underside must not exceed 1/8” on thermite welds.

(p) Horizontal alignment must be straight for at least 36” through the weld area. To meet this requirement when welding in curved track, rail positioners (aligners) must be used.

(q) Horizontal rail end alignment shall be made along both sides of the head, web and base edges of the rail. Adjustments shall be made such that:

i) On new rails, or rails with comparable gauge face wear, any difference in the width of head, web or base shall be divided equally on either side.

ii) On rails with uneven head width, the bases and webs of the rails shall be aligned so that the horizontal offset in the head, web or base does not exceed 0.06”. The gauge and field sides of the railhead shall be blended in by grinding.

(r) Head bond weld nuggets of exothermic rail bonds, which fall within the mold are, must be completely removed by grinding prior to thermite welding.

(s) Immediately prior to mold installation the rail ends and surface area that will be exposed to the thermite material must be cleaned a minimum distance of 6” from the end with a wire brush or a grinding wheel in order for this area to be free of grease, rust, and other foreign material, along with any other recommendations of the welding kit manufacturer.

(t) Molds must be centered over the weld gap.

(u) During sealing of the molds, cardboard inserts must be placed over the molds to prevent any foreign material from falling into the mold cavity.

(v) Check the plastic bag containing the charge, ensuring that the bag is sealed and has not been punctured in handling.

(w) Before preheating, check the rail temperature with a rail thermometer, if the rail temperature is below 60 degrees Fahrenheit both rails must have supplemental heat applied to raise the rail temperature to at least 100 degrees Fahrenheit.

i) The length of the rail to be supplementally heated shall be between 30 and 36 inches for rail temperatures between 60 degrees Fahrenheit down to 16 degrees Fahrenheit.

(x) A rail expander will be placed on the rail to maintain the correct gap and crown unless temperature conditions are such that the possibility of rail movement is eliminated.

i) If a change in rail temperature is anticipated while the weld is being poured or while it is cooling, the rail expander should be adjusted to compensate for any stresses which will occur at the weld due to a change in temperature.

ii) Depending upon the type of change expected, one of the following procedures will assist in preventing temperature induced stresses from affecting the quality of the weld.

.1 Rail temperature is low and a raise in temperatures is anticipated, the rail expander should be set up to expand the gap and enough pressure built up to cause a slight increase in the gap. This should prevent any subsequent decrease in gap width.

.2 Rail temperature is high and a drop in temperature is anticipated, the rail expander should be set up to pull and enough pressure built up to cause a slight subsequent increase in width.

.3 Whenever either of the above procedures is required, the final gap width must be as stated in the manufacturers instructions for the rail weight being welded.

.4 The rail expander must remain on the rail until the weld is complete and has cooled to 700 degrees F. This is verified when the center of the weld around its entire periphery will not melt a 700 degree F tempilstick.

.5 When the rail expander is removed, it must be released in a gradual manner.

(y) Rail ends will be preheated prior to welding to a sufficient temperature and for a sufficient time to ensure full fusion of the weld metal to the rail ends without cracking of the rail or weld, per manufacturer's instructions. Preheating must not be interrupted and the heat shall be uniformly distributed over the rail ends. The preheat time specified for the process must be adhered to.

(z) Ignition must be preformed immediately after preheating.

(aa) During the pour, the crucible must be centered over the mold. When the pour is completed the molten slag must be allowed to solidify for three minutes prior to removing the slag pot. **For the CJ One shot crucible, the slag pot must not be removed until 5 minutes after the pour. The weld must not be sheared until 6.5 minutes after the pour.**

(bb) In the event of a leak, apply molded fusal paste with the end of a wood handle at least 36" in length. Never attempt to stop a leak in any other manner.

(cc) Should the thermite reaction or the time delay of the self-tapping thimble be abnormal, the weld must be rejected.

(dd) With multi-use crucibles if the reaction is abnormal and the automatic thimble doesn't tap, the crucible should be left standing over the mold for 5 minutes. If the thimble releases during that time, the metal will pour into the mold and although the weld will have to be cut out, there is no danger of personal injury. The loaded crucible should then be carefully set aside and no attempt made to empty it until the metal has cooled. After cool down, the metal is easily dumped.

(ee) With power shears or a sledge hammer and hot cut chisel, remove the excess metal, while still hot, off the sides of the ball of the rail.

(ff) Never dump hot slag or any molten material on wet soil, wet ballast, or into water. To extinguish a metal fire, use only dry sand. The use of vapour forming extinguishing materials is forbidden.

(gg) The mold shall be left in place after tapping for a sufficient time to permit complete solidification of the molten metal and proper slow cooling to prevent cracking and provide a complete weld with the proper hardness and ductility.

(hh) Thermite welds shall be ground hot. When hot grinding, the weld shall be left at least 0.032" above the parent rail steel on the running surface, to ensure it does not shrink below the rail head upon cool down. The contour radius, gauge face and field side of the head shall be hot ground flush or blended in where necessary. Do not grind the rail head free hand.

(ii) After the weld has cooled to ambient temperature it shall be cold ground, flush with the rail surface and blended in where necessary. Do not grind the rail head free hand. Check the final contour of the rail head with a 36" straight edge.

(jj) The weld must be protected against water or any liquid for two hours after finish grinding. Welds shall be allowed to cool normally, without induced cooling.

(kk) Date and initials of welder and Contractor's name shall be placed on the web of the rail with metal marking paint and all welds shall have a number based upon a numbering system approved by the Contract Administrator. These marks will be placed on the field side of the rail being welded.

(ll) Contractor shall not add more rail than what was removed when installing insulated joints, replacement rail, and performing welds after final de-stressing of the CWR.

(mm) Contractor shall provide sufficient time to allow welds to cool to 450 degrees Fahrenheit and have completed the finish grinding prior to any equipment movement across welds.

(nn) With the "unfinished" base of the thermite welds the Contractor will need to exercise caution when adjusting the rail so as not to bind the rail at a tie plate, or allow the ties to be skewed.

(oo) No additional welds shall be installed within 3‘of an existing plant weld and 6’ of an existing thermite weld.

E53.14.3 Field Quality Control

(a) All welds giving fault indication by ultrasonic inspection or visible inspection, being unacceptable, shall be replaced at Contractors expense. This includes the addition of a rail plug and additional welds where required.

i) Ultrasonic testing of all completed welds in the track shall be carried out as specified herein.

ii) All initial testing and submittals shall be performed as directed by the Contract Administrator at no cost to the Contractor.

iii) Welds not meeting the following requirements will be rejected:

.1 Each weld shall have full penetration and complete fusion with no evidence of surface or internal fissures or cracks.

.2 Porosity or slag type defects shall not exceed 0.040 inches in any dimension and the total area of all defects shall not exceed 0.024 square inches.

.3 Conformance to alignment tolerances.

iv) If a defective weld is found, it shall be cut out and a new section not less than 10’ long on tangent track and not less than 20’ long on curved track shall be inserted, welded with two thermite welds, and re-tested all at Contractor’s expense.

v) Ultrasonic testing will be performed by a competent material testing service as determined by the Contract Administrator.

vi) All welds shall be visually inspected by the Contractor and Contract Administrator for surface cracks and alignment. Welds with surface cracks visible to the eye or not within the alignment tolerances will not be acceptable.

E53.15 Ballasting and Surfacing

E53.15.1 General

(a) Contractor shall supply, haul and unload all crushed rock ballast material, surface, tamp, line, finish surface, regulate, and power broom new track constructed. All track shall be surfaced and tamped as soon as possible after unloading ballast.

i) Ballast shall be placed to a minimum depth of 12” below the bottom of the ties at grade point to the dimensions and widths (minimum 12” shoulders for CWR) as shown on the Drawings. Ballast shall be compacted by approved tamping methods to hold track firmly in place. All tamping operations shall be performed with an approved power tamper machine.

ii) Placement of ballast and surfacing of track shall be done in a manner such that all tolerances and requirements of these Specifications shall be retained by the track structure for a period of 1 year from the time of acceptance.

(b) The Contractor at their expense shall provide all the plant, equipment, and labor necessary to unload and transport the ballast to the track construction site and distribute the ballast to the track structure.

E53.15.2 Execution

(a) Contractor will direct the unloading and distribution of ballast and will be fully responsible for all aspects of the unloading and distribution, subject to approval by the Contract Administrator. All costs associated with any equipment derailed during ballasting including repairs to damaged railway equipment will be the responsibility of the contractor.

(b) When unloading ballast in the center of the track, a plow tie may be used in order to evenly spread ballast and prevent excessive rock from accumulating on the rail and possibly derailing cars.

(c) After unloading ballast, all cars must be completely empty and doors closed and locked prior to releasing.

(d) Power tamping machines are to be used throughout all track construction. Manual tamping will not be allowed. The use of a ballast compactor together with the power tamping machines may be used with the written permission of the Contract Administrator.

i) Tamping machines are to be automatic multi-tooled with a minimum of 8 tamping feet per rail and having automatic profile reference beams of not less than 75'.

ii) Each tool shall have a tamping pressure sufficient to close the ballast beneath each tie. The foot of each tool shall be a minimum of 1½" x 3" at all times.

iii) A junior tamping machine less the reference beam may be used in conjunction with a lead machine provided that all other characteristics of the lead machine are the same on the junior tamper. The tamping machine with the reference beam will tamp a minimum of every second tie.

iv) Any proposed ballast compaction equipment shall be included in Form K: Equipment and is subject to acceptance of the Contract Administrator.

(e) No part of the track structure will be raised more than 3" in any one lift. New track construction will have to be worked more than once and the Contractor will have to apply additional ballast to conform to the ballast cross section shown within the Typical Track Section drawings.

(f) Each lift is to be tamped from a line 16" inside each rail on both sides of and to the ends of the ties. Center area between these limits shall be filled lightly with ballast but not tamped. Tamping shall proceed, simultaneously; at both ends of the tie making sure ballast is forced directly under the ties and against the sides and ends of the ties.

i) Too many insertions with a power tamper may cause a center bound track condition. Generally two squeezes per tie up to 1½" of raise with one additional insertion and squeeze for each additional 1" of raise is required with insertion depth being a minimum of 1½" below the bottom of tie.

ii) When the track has been raised to within 2" of final grade, the final lift shall be made by raising the track up to grade stake elevation making necessary allowance for settlement. The ballast shall be applied under the ties for their entire length.

(g) During raising and tamping, if any crib area is void of ballast below the bottom of the tie then the area of the track is to be re-tamped following the application of additional ballast.

(h) While raising and tamping track levels shall be constantly used to insure correct surface and cross level.

i) Contractor will finish each point on the track to within a maximum of ½" deviation from zero cross level on tangent. Average cross level on tangent and super elevation on curves will be as specified.

ii) Contractor will finish the track so that the difference in cross level between any two points less than 62' apart on tangents and on curves between the spirals must be no more than 1". Deviation from zero cross level at any point on tangent may not be more than ½". Variations in cross level on spirals in any 31' may not be more than ¾". Track will be finished so that the deviation from uniform profile on either rail at the mid-ordinate of a 62' chord may not be more than 1¼".

iii) Contractor will finish the track so that the horizontal alignment between any two points 62' apart on tangent track will deviate from a straight line by no more than ¾". Mid ordinate of a 62' chord between two points on the gauge side of the outer rail will be one inch per degree of curve with an allowable tolerance of plus or minus 5/8".

(i) After track has been brought to true surface, elevation, and grade, it shall be given a final lining and placed in true alignment and grade conforming to the elevations and alignment according to the Drawings and the ballast dressed to the design ballast cross section.

(j) When raising track, the Contractor has a tolerance of plus or minus ½" to the design grade as long as requirements of this Section are met. If not raised to the established grade, then the Contractor will unload ballast in sufficient quantity and continue to surface the track to comply with the tolerances.

  i) All ties are to be straightened and re-spaced as necessary immediately prior to unloading ballast for the final raise.

  ii) If the Contractor raises the track too high to comply with the allowable tolerance, Contractor, at his expense, will excavate the ballast sufficiently to lower the track and then surface the track again to bring it into full conformity.

(k) When track is lifted or jacked, care must be exercised by the Contractor to avoid stressing or permanently bending the rail, joints, or turnout components.

(l) When surfacing through a turnout with boltless adjustable rail braces, switch points and stock rails will be blocked to prevent displacement of stock rail from the switch plate.

(m) Tamp turnout ties for 16" on each side of main and turnout rails. Headblock ties to be tamped as above with no voids under remainder of tie.

(n) Turnout tie cribs are to be full except to prevent contact with rods and for drainage as required.

(o) Contractor will correct any hanging or skewed tie that is a result of his tamping and raising the track. Tie plates will be positioned so that the shoulder is against the outside base of rail for the entire length of the shoulder.

  i) Contractor will plug and re-drive all high or loose spikes and will plug and replace all spikes removed.

  ii) Contractor will replace and/or adjust all tie plates and rail anchors knocked off or that worked loose or were damaged during the surfacing and regulating. The anchors must remain matched across from each other on each rail. Tie plates must remain square to the tie.

(p) Contractor will provide the ballast section as shown in the Typical Track Section drawings. No dirt or foreign materials will be allowed into the ballast section.

(q) After track has been brought to true surface, elevation, and grade it shall be given a final lining and placed in true alignment conforming to design and the ballast shall be trimmed neatly to the dimensions and widths of the Typical Track Section drawings

  i) Cribs shall be filled to top of tie.

  ii) No ballast will be left on top of ties, spikes, fasteners and plates.

(r) Surplus ballast shall be spread evenly along the ballast slopes. Dressing of the ballast by placing earth higher than the toe and thus preventing proper drainage will not be permitted. After all ballast placement has been completed, the track shall be given a complete power broom finish with approved machinery. Contractor shall insure that the top of ballast rock matches the top of tie surface and that no excess ballast remains on either the top of rail, top of tie, base of rail, or top of tie plate, spike or anchor or roadway crossing surface.

(s) Contractor shall exercise caution while regulating ballast shoulders so as to avoid track misalignments and to avoid obstructing adjacent drainage ditches, structures, or culverts with ballast, dirt, vegetation, or other material.

  i) If Contractor obstructs an adjacent drainage ditch, structure, or culvert, he will have to initiate the cleaning of those as soon as possible.

  ii) Contractor is responsible to ensure that the partially ballasted track in his work area does not buckle out of alignment. If a misalignment of the track occurs as a result of the Contractor's operations, he must correct at his expense.

E53.16 Crossings

E53.16.1 General

(a) This section includes the installation requirements of all softwood crossing surfaces as indicated on the Drawings.

(b) Conform to all applicable Local, Provincial and Federal laws, codes, specifications and ordinances for materials and installation of the crossings as they apply to this Specification.

(c) The Contractor will be allowed, at the Contractor's expense, to supply and install additional temporary crossings as required for convenience and shall make good, at the Contractor's expense, any track material damaged by same. This shall include all material and labour required to meet the specifications of this project. Upon completion of all work these temporary crossings are to be removed, at the contractors expense.

(d) Contractor is responsible for any and all approved detouring, detour roadways, all signage, barricading and traffic control that may be necessary to facilitate crossing installation. It shall be the sole responsibility of the Contractor to erect and maintain such detour roadways, signage, barricades and traffic control as required by during the length of time that the road is closed to traffic or while crossing protection is required.

(e) Track materials and construction execution associated with crossing installation to be in accordance with all parts of these Specifications.

E53.16.2 Execution

(a) Softwood Crossing Surface

i) Install new 7" x 9" x 9' hardwood crossing ties at locations shown on drawings in accordance with E53.9.1 of these Specifications except ties to be installed at 19½" centers.

(b) Install new softwood crossing planks.

i) Planks will be cut to length as required with the outer ends of all planks beveled so to minimize the effects of dragging equipment.

ii) Planks will be placed such that a flangeway space not less then 3" nor more than 4¾" wide shall be provided between the gauge side of the running rails and the planking. A flangeway on the field side of the running rails will not be allowed.

iii) Planks will be fastened to the crossing ties by means of the ¾" x 12" hex lag bolts and washers through the prebored holes in the planks. Should additional pilot holes be required they will consist of a 5/8" hole drilled a minimum of 5" into the crossing plank such that they are aligned with every 4th crossing tie.

iv) All wood surfaces exposed by either cutting or drilling must be treated with P2 - Petroleum Creosol.

v) All cross ties within crossing planks and for a distance of 20' in each direction shall be fully anchored.

vi) Remove all debris from site and leave crossing in a clean condition.

E53.17 Track Material Removal and Salvage

(a) Track Material Removed shall include disassembling, collecting, loading and unloading, transporting, sorting and stockpiling at a location designated by the Contract Administrator. Any material damaged either intentionally or inadvertently through this process will be replaced at the Contractor's expense with material in equal condition as approved by the Contract Administrator.

(b) Track Material Salvaged shall be collected and removed from the site at no additional cost. Unless otherwise specified, track removal will include all OTM and the Contractor is to

ensure all loose material is collected and the site is left in an acceptable condition to the satisfaction of the Contract Administrator.

E53.18 Fencing Removal

(a) Fencing Removal shall include disassembling, collecting, loading and unloading, transporting, sorting and stockpiling at a location designated by the Contract Administrator. Any material damaged either intentionally or inadvertently through this process will be replaced at the Contractor's expense with material in equal condition as approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E53.19 The Unit Price, submitted in the Bid, shall include the entire cost of supplying all labour and equipment to construct trackage as shown on the Drawings and specified in this Specification. With the exception of the quantities identified with the track WM01 connection grading complete shall be considered incidental to the Work.

E53.19.1 "Supply and Install 136lb Jointed Track Structure on New No.1 Treated Hardwood Ties Complete" will be paid for at the contract unit price per track foot bid for this work including rail, anchoring, tamping, trimming, lifting, lining and surfacing, to design elevations and dimensions, exclusive of placing ballast. Track complete shall include the rail, ties, tie plates, anchors, track spikes, OTM (including bond wires complete), de-stressing and all other incidental items. Track feet of 136lb track construction will be based on as-built measurements taken by the Contract Administrator upon completion of all surfacing. Length of track constructed will be measured from the centerline of the first and last track ties (excluding switch ties). Payment will be based on the track feet completed. A track foot is described as the lineal measurement in feet along the centerline of a set of rails (two rails). Completed track will be measured for length along the centerline of track by the Contract Administrator. Length of measurement will be rounded up to the nearest whole foot.

E53.19.2 "Supply and Install 136lb Thermite Welds Complete" will be paid for at the contract unit price per weld bid for this work. Thermite Welding Complete shall include all material, equipment and manpower required to weld as outlined in section E53.14.

E53.19.3 "Install Supplied No.12 LH 136lb RBM Turnout Complete" will be paid for at the contract unit price per turnout bid for this work including rail anchoring, aligning and surfacing, exclusive of ballasting. Turnout complete shall include the turnout rail, transition rail, frog, switch ties, switch stands, switch plates, frog plates, tie plates, anchors, clips, screws, track spikes, OTM and all other incidental items. Turnout construction will be based on as built measurements taken by the Contract Administrator upon completion of all surfacing. Turnouts will be counted as each.

E53.19.4 "Reline Existing Track" will be paid for at the contract unit price per track foot bid for this work including relining track, preparation as required, tamping, trimming, lifting, lining and surfacing to design elevations and dimensions.

E53.19.5 "Removal of Shoofly 136lb CWR Track Material" will be paid for at the contract unit price per track foot bid for this work including dismantling of track, sorting of rail and OTM, transporting the material to a designated stockpile location on-site, exclusive of ballast removal.

E53.19.6 "Removal of No. 10 136lb Turnouts" will be paid for at the contract unit price per turnout removed bid for this work including dismantling of turnout into sections, transporting the turnout sections to a designated stockpile location on-site, exclusive of ballast removal.

E53.19.7 "Removal and Stockpile of Ballast" will be paid for at the contract unit price per cubic yard of ballast stockpiled at a designated stockpile location on-site. This work shall include collection, loading, transportation and stockpiling of ballast as directed by the Contract Administrator.

E53.19.8 "Supply and Install Ballast" will be measured and paid for at the contract unit price per cubic yard. This shall include placement of ballast on skeletonized track include unloading and placing sufficient ballast to enable 12" of ballast under the tie complete with 12" shoulders noted within this Specification or on the Drawings.

E53.19.9 "Install Supplied 39' Track Panels Complete" will be paid for at the contract unit price per each bid for this work, including fully anchoring, transporting and installation. Installation shall include the rail, ties, tie plates, anchors, track spikes, OTM, all other incidental items. Panels will be counted as each and must be inspected by the Contract Administrator prior to installation.

E53.19.10 "Salvage of Removed 136lb CWR Rail" will be applied as a credit to the City at the contract unit price per track foot, which will include removal from the site.

E53.19.11 "Salvage of Removed Pre-Plated Track Ties Complete with Spikes & Anchors" will be applied as a credit to the City at the contract unit price per tie, which will include removal from the site.

E53.19.12 "Salvage of Removed No. 10 136lb Turnouts" will be applied as a credit to the City at the contract unit price per turnout, which will include removal from the site.

E53.19.13 "Reclaim and Place Crushed Sub-Base Material" will be paid for at the contract unit price per cubic meter. This work shall include collection, loading, transportation and placement into the design embankment as directed by the Contract Administrator.

E53.19.14 "Removal and Stockpile of Crushed Sub-Base Material" will be paid for at the contract unit price per cubic yard of ballast stockpiled at a designated location on-site. This work shall include collection, loading, transportation and stockpiling of sub-base material as directed by the Contract Administrator.

E53.19.15 "Removal and Stockpile Sub-Ballast Material" will be paid for at the contract unit price per cubic yard of ballast stockpiled at a designated stockpile location on-site. This work shall include collection, loading, transportation and stockpiling of sub-ballast material as directed by the Contract Administrator.

E54. RAILWAY PROPERTY CLEANING

DESCRIPTION

E54.1 General

E54.1.1 Conduct cleaning and disposal operations to comply with local ordinances and anti pollution laws.

E54.1.2 Store volatile wastes in covered metal containers and remove from premises daily.

E54.1.3 Prevent accumulation of wastes which create hazardous conditions.

E54.1.4 Provide adequate ventilation during use of volatile or noxious substances.

MATERIALS

E54.2 Use only cleaning materials recommended by manufacturer of surface to be cleaned and as recommended by cleaning material manufacturer.

CONSTRUCTION METHODS

E54.3 Cleaning During Construction

E54.3.1 On a daily basis maintain premises free from debris and waste material.

E54.3.2 Maintain project site and public properties free from accumulations of waste materials and rubbish.

E54.3.3 Remove waste materials and rubbish from site.

E54.3.4 Disposal of wastes on Railway property by burial or burning shall not be permitted.

MEASUREMENT AND PAYMENT

E54.4 Cleaning

E54.4.1 Cleaning and disposal operations are considered incidental to the Work and no separate measurement or payment will be made

E55. RAILWAY GRADING AND DRAINAGE

DESCRIPTION

E55.1 General

E55.1.1 Further to City of Winnipeg Standard Specifications the following shall apply.

E55.2 Definitions

E55.2.1 Embankment Fill: material placed above original ground or stripped surface to construct the sub-base for the rail bed or gravel pad.

E55.2.2 Sub-base elevation: elevation immediately below sub-ballast or road surface gravel.

E55.3 Requirements of Regulatory Agencies

E55.3.1 Adhere to municipal, provincial and national government requirements relating to safety of excavations and protection of workers.

E55.4 Soil Conditions

E55.4.1 A soil investigation has been carried out at the site to determine soil conditions, soil characteristics and water levels.

(a) The Geotechnical Report is included in Appendix A.

E55.4.2 The City will not accept unfamiliarity with encountered soil conditions and water levels as a basis for a claim for additional payment.

MATERIALS

E55.5 Embankment materials require approval by Contract Administrator.

E55.6 Material used for embankment shall not contain organic matter, frozen lumps, snow, ice, weeds, roots, logs, stumps or any other objectionable matter.

E55.7 Embankment Fill Material

E55.7.1 Embankment fill material from off Railway property shall consist of 100 mm crushed limestone sub-base materials with properties as specified in CW 3110.

E55.7.2 The Contractor shall identify his proposed source of embankment fill material after award, no later than one week prior to commencement of construction.

E55.7.3 The Contractor shall provide at no cost to the City representative samples to the Contract Administrator for approval in accordance with CW 3110.

E55.7.4 Embankment fill material shall not be used for embankment construction prior to approval by the Contract Administrator.

CONSTRUCTION METHODS

E55.8 Preparation of Areas for Earth Works

E55.8.1 Strip fill areas of unsuitable materials as designated by Contract Administrator.

E55.8.2 Stripped material shall be classified as "Topsoil Excavation".

(a) Unless specified otherwise, this material is paid under "Topsoil Excavation".

(b) Strip organic material to necessary depth or as directed by the Contract Administrator.

(c) Salvage stripping material for later re-use on embankment side slopes.

(d) The maximum depth of stripping in ditches shall be the ditch invert unless subgrade material is deemed unsuitable by the Contract Administrator.

(e) After completion of embankment, spread stripping uniformly against embankment cut and fill slopes or as directed by the Contract Administrator. Any excess material is to be disposed of in accordance with CW 1130.

E55.9 Excavating

E55.9.1 General

(a) Advise Contract Administrator sufficiently in advance of excavation operations for initial cross-sections to be taken.

(b) Remove and dispose of material off Railway property in excess of requirements for embankment construction as directed in accordance with CW 1130.

(c) Take particular note of the following:

i) Where necessary, the Contract Administrator may design cuts and fills especially for stability, which will affect dimensions indicated on the Drawings.

ii) Remove unsuitable materials encountered in cut sections to depth and extent directed.

a. Replace with approved material and compact.

iii) When slides occur in cuts after they are properly formed, remove the material, modify the slopes and adopt other precautions as directed.

1. The materials shall be classified as "Common Excavation" and Contractor will be paid for its removal at the unit contract price for "Common Excavation".

iv) Complete all excavation as far in advance of fill construction as practical.

v) Maintain all work in a well-drained condition, free of debris and other obstructions.

(d) The City will not pay for additional excavation (borrow or common) which the Contractor may require for his convenience or movement of equipment.

E55.9.2 Waste Material

(a) Remove and dispose of unsuitable material as directed.

i) Refill depressions and holes from this work. This work shall be paid for at the contract unit price for “Common Excavation”.

(b) Remove and dispose of material off Railway property in excess of requirements for embankment construction as directed.

E55.9.3 Ditch Excavation

(a) Complete ditch excavation as far in advance of embankment construction as practical, to the grades set by the Contract Administrator, to permit ready flow of surface water.

(b) Excavate ditches in cuts at the same time as the main cut in order that the excavated material can be used in adjacent embankments.

(c) Use suitable equipment to ensure cut slopes and sub-base sections are not undercut.

(d) Maintain and keep ditches open and free from debris and other obstructions until final acceptance.

E55.9.4 Material Removal and Stockpiling

(a) Use suitable equipment to ensure cross contamination of nearby materials is kept to a minimum.

(b) Maintain all work in a well-drained condition, free of debris and other obstructions.

(c) Stockpile material at a location identified by the Contract Administrator.

E55.10 Embankments

E55.10.1 Where indicated or directed by Contract Administrator, bench into existing slopes to ensure a proper bond between new materials and existing surfaces.

(a) The City will not pay extra compensation for this operation.

E55.10.2 Prior to placement of fill material, compact subgrade to 95% of Standard Proctor maximum density, in accordance with this Specification and CW 3110.

E55.10.3 Do not place material which is frozen or place material on frozen surfaces.

E55.10.4 Maintain a crowned surface during construction to ensure ready run-off of surface water.

E55.10.5 Take particular note of the following:

(a) Where fills are to be placed over areas with weak formation soils, use a stage loading technique to construct embankments.

(b) Where significant long term settlements are expected, Contract Administrator will increase the top width of embankments from the standard dimensions indicated.

E55.10.6 Maintain fill to typical sections indicated on drawings.

E55.10.7 Placement of Geotextile

(a) Place geotextile in accordance with CW 3130 and this Specification.

(b) The geotextile shall be installed full width for the required length of the embankment in accordance with the manufacturer's recommended procedure. Align machine direction parallel to the rail line, free of tension, stress, folds, wrinkles, or creases. Joints in the fabric shall be overlapped not less than 600 mm (2 feet).

(c) The fabric shall be placed within a key in the existing embankment and secured as directed by the Contract Administrator.

(d) The fabric shall be placed and wrapped back upon itself at the end away from the track as directed by the Contract Administrator.

(e) Dumping of material or equipment movement directly on the geotextile will not be allowed.

(f) The geotextile shall not be exposed more than 48 hours before covering.

E55.10.8 Execution

(a) Compact all embankment fill material and excavations to a density of not less than 95% maximum dry density in accordance with Standard Proctor Compaction Test (ASTM D698).

(b) Place and compact embankment fill to full width of section in uniform layers not exceeding 200 mm (8 inches) loose thickness. Contract Administrator may authorize thicker lifts if specified compaction can be achieved.

i) Do not place boulders exceeding 200 mm (8 inches) in diameter in the fill.

ii) Do not place boulders exceeding 150 mm (6 inches) in size within 600 mm (2 feet) of sub-base level.

(c) Scarify or disk and aerate fill material which is too wet, until proper water content for compaction is attained. With approval of Contract Administrator, blend drier material with wet material to achieve a water content satisfactory for compaction as specified in 3.4.4.

(d) Remove material not thoroughly compacted at no cost to the City.

(e) Where compaction is not being obtained, cease placing material and give additional compaction to material in place.

(f) Operate sufficient compaction equipment to thoroughly compact the fill at the rate being placed.

(g) Place and compact side slopes of fills simultaneously with core of fill.

i) Do not construct fill by means of central core finished off by side dumping of materials to make up the section.

(h) In areas incapable of supporting earth moving equipment, increase the cover over the areas to sufficiently support equipment.

i) Place the layer over full width of embankment.

ii) Thoroughly compact the surface.

iii) Build remainder of fill in layers of specified normal thickness.

iv) Use granular material for initial fill layer in soft swampy areas, as directed.

(i) Route all loaded earth-hauling equipment over entire width of embankment.

(j) Construct and maintain embankments in a well-drained condition.

E55.11 Field Quality Control

E55.11.1 To be completed in accordance with CW 3110.

E55.12 Finishing

E55.12.1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material.

E55.12.2 Shape and compact entire rail bed to design elevations within 13 mm (0.5 inch) of design but not uniformly high or low.

E55.12.3 Do scarifying, blading, compacting or other methods of work as necessary to provide thoroughly compacted rail bed shaped to grades and cross-sections indicated or directed.

E55.12.4 Finish back and side slopes of common material to neat condition, true to line and grade.

E55.12.5 Trim all waste and stockpile areas neatly and maintain in a well-drained condition.

E55.12.6 Maintain finished surfaces in a condition conforming to this section until acceptance and surveyed by the Contract Administrator.

MEASUREMENT AND PAYMENT

E55.13 General

E55.13.1 The Unit Prices, submitted in the Bid, shall include the entire cost of supplying all labour, material, equipment and tools for stripping, excavation and grading of all classes of material; all as required to construct final rail bed and embankment as shown on the Drawings and specified in this Specification.

E55.13.2 The Unit Prices shall also include the cost of supplying all pumping, bailing, shoring and sheeting, etc. and also the furnishing of all necessary pumps, tools and equipment required to keep all excavations dry.

E55.13.3 All measurement and payment will be in accordance with applicable City of Winnipeg Specifications.

E56. RAILWAY GRANULAR MATERIALS

DESCRIPTION

E56.1 Supply, placement and compaction of granular material for sub-ballast material.

MATERIALS

E56.2 State on Form J: the source of granular materials to be incorporated into work.

E56.2.1 Contract Administrator will investigate quality of material after award of contract.

E56.3 Materials require approval before being used in the Work.

E56.4 Provide access for sampling.

E56.5 The Contractor shall provide, at no cost to the City, necessary equipment to obtain samples of granular materials.

E56.6 If requested, the Contractor shall submit samples of the proposed granular material for testing and evaluation.

E56.7 If, in opinion of Contract Administrator, materials from proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate an alternate source or demonstrate that material from source in question can be processed to meet specific requirements.

E56.8 Should a change of material source be proposed during work, advise Contract Administrator 2 weeks in advance of proposed change to allow sampling and testing.

E56.9 Acceptance of a material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

E56.10 When common excavation material is suitable for use as granular material, use such common excavation materials as granular material in preference to obtaining granular material from other sources.

E56.11 Include in unit price for granular material entire cost of constructing and/or maintaining suitable access roads, opening work faces, clearing, grubbing and stripping of pit areas, and royalties.

E56.12 Sub-ballast:

E56.12.1 Material to be crushed or screened pit run gravel, containing no more than 3% organics by weight as determined by ASTM C 123.

E56.12.2 Gradations to be within limits specified.

Sieve Size	Percent Passing
75 mm (3")	100
25 mm (1")	60 - 90
4.75 mm (#4)	35 - 60
425 micro m (#40)	10 -40
75 micro m (#200)	3 - 10

CONSTRUCTION METHODS

E56.13 Placing

E56.13.1 Use granular material to construct sub-ballast course and other work as indicated or directed.

E56.13.2 Do not place granular material until finished sub-base surface is inspected and approved by Contract Administrator.

E56.13.3 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.

E56.13.4 Place, using methods which do not lead to segregation or degradation of material.

E56.13.5 Place material to full width of section in uniform layers not exceeding 150 mm (6 inch) loose thickness and compact to specified density. Contract Administrator may authorize thicker lifts if specified compaction can be achieved.

E56.13.6 Replace fouled material with approved material and compact, at no cost to the City.

E56.14 Compaction

E56.14.1 Compact full width to density not less than 95% maximum dry density in accordance with Standard Proctor Compaction Test (ASTM D698).

(a) Sub-ballast – 95% Standard Proctor Maximum Dry Density.

E56.14.2 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

E56.14.3 Apply water to reduce dust nuisance.

E56.14.4 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

E56.15 Field Quality Control

E56.15.1 Contract Administrator shall take representative samples at expense of Contractor and submit them to laboratory tests for approval of its quality and nature prior and/or during its use.

(a) Provide necessary personnel and equipment to permit adequate investigation and sampling.

(b) Advise Contract Administrator at least two weeks in advance of use of any material to allow sufficient time for sampling and testing.

(c) The City will pay for testing of material.

E56.15.2 Contract Administrator may perform density and other tests on site, to control construction.

(a) Facilitate such work and pay for any testing apparatus damaged from the operations.

(b) Do not claim for delays to the operations resulting from field tests.

E56.15.3 Final acceptance of materials made after materials dumped, spread and compacted in place.

(a) Contract Administrator may reject at source, on transportation vehicle or in place.

(b) Contract Administrator will not consider for payment the removal and disposal of any rejected material.

E56.16 Finishing

E56.16.1 Finished sub-ballast surface shall be within 15 mm (0.5 inches) of design elevations but not uniformly high or low.

E56.16.2 Maintain surface in a clean condition, free draining and conforming to this Specification until final acceptance.

MEASUREMENT AND PAYMENT

E56.17 The Unit Price, submitted in the Bid, shall include the entire cost of supplying all labour, material and equipment to supply, load, haul, place and compact suitable granular materials in the Work as shown on the Drawings and specified in this Specification.

E56.18 Granular material will be measured on a weight basis and paid for at the Contract Unit Price per tonne for “Supply and Placing Sub-Ballast Material”, 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.

E56.19 Granular material placed outside design sections as staked by the Contract Administrator will not be considered for payment.

E57. CORRUGATED STEEL PIPES FOR RAIL WORKS

DESCRIPTION

E57.1 Further to CW 3610 and CW 3615, this section specifies requirements for supplying and installing corrugated steel pipes complete with riprap.

MATERIALS

E57.2 Corrugated Steel Pipe (C.S.P.) size and gauge to be as indicated on drawings.

E57.3 Manufacture all culverts to the CN Specification contained on Plan Number R7A-80_2, dated September 29, 2003.

E57.4 Asphalt coating is not required.

E57.5 Coupling bands to be 600 mm (24 inches) wide and annularly corrugated unless indicated otherwise.

E57.6 Pipe ends to be annularly corrugated over length of 300 mm (12 inches).

E57.7 Granular Backfill:

E57.7.1 Material to be pit-run gravel.

E57.7.2 Gradation to be a maximum of 8% fines passing the 75 micrometer sieve size and maximum size not to exceed 100 mm.

E57.7.3 Liquid limit shall not exceed 25 and the plasticity index shall not exceed 6.

E57.7.4 The Contractor shall provide a sieve analysis of the granular backfill or provide samples of the granular backfill to the Contract Administrator for testing if requested.

E57.8 Bedding Sand

E57.8.1 Bedding material shall be clean sand consisting of hard durable particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

E57.8.2 Material shall meet the following gradation:

Sieve Size (mm)	Percent Passing (by weight)
12.5	100%
5.0	95%
0.63	2 - 10%
0.075	0 - 3%

E57.8.3 The Contractor shall provide a sieve analysis of the sand for the Contract Administrator's approval or provide samples of the sand to the Contract Administrator for testing if requested.

CONSTRUCTION METHODS

E57.9 General

E57.9.1 Install culverts in accordance drawings, CW 3610 and this Specification and.

E57.10 Placing of Pipes

E57.10.1 C.S.P.:

(a) Culverts are to be installed in the upgrade direction to allow flow of water at all times.

E57.11 Backfilling

E57.11.1 Do not place backfill until culverts are inspected and approved by the Contract Administrator.

E57.11.2 Place and compact approved granular backfill material in layers not exceeding 200 mm (8 inches) loose thickness.

(a) Compact granular material in accordance with CW 3610.

(b) Place granular backfill material simultaneously on both sides of culvert to avoid eccentric loading.

i) For culverts not under railway tracks, carry material to height of ¼ diameter of pipe but not less than 300 mm above top of culvert.

ii) For culverts under railway tracks, carry compacted granular material to height equal to diameter of culvert above top of culvert, prior to constructing embankment over the culvert.

iii) When placing culverts the minimum allowable distance below base of rail, carry the compacted granular material to sub-base level.

(c) Compacted granular backfill material is to extend horizontally from the outside of culvert, a distance equal to diameter of pipe but not less than 600 mm (24 inches), except where pipe is laid in excavated trenches, then backfill and compact to full width of trench.

(d) In areas not accessible to rolling equipment, place in lifts not exceeding 150 mm (6 inches) and compact to specified density with approved mechanical tampers.

(e) Do not place large stones, rocks or other sharp objects within 1.2 metres (4 feet) of culvert.

(f) Do not damage nor distort the culvert.

i) Replace damaged culverts at no cost to the Contract Administrator.

(g) Do not place frozen material, ice and snow in backfill material.

(h) Use approved embankment fill (common excavation or borrow material) material to bring up the remaining backfill to sub-base and compact to required density as specified in Section E56 - Railway Granular Materials.

E57.12 Protection of Pipes During Construction

E57.12.1 Where applicable, place a sufficient depth of common material over the granular backfill to protect culverts against heavy construction equipment.

E57.13 Culvert Removal

E57.13.1 Excavate, relocate/remove existing culverts indicated on the Drawings or as directed by the Contract Administrator.

E57.13.2 Culverts removed that are not to be relocated are to be disposed of off-site.

E57.13.3 Shape the slopes around culverts to match the ditch and embankment lines and grades.

E57.14 Riprap at Ends of Pipe

E57.14.1 Shape and trim the slopes and ditch bottom neatly prior to placing riprap as indicated on the Drawings or as directed by the Contract Administrator.

(a) Fill all depressions and compact.

E57.14.2 Place riprap in accordance with CN plan number R7A-80_2 dated September 29, 2003.

E57.14.3 Place riprap as indicated on typical sections, fill all voids and trim neatly prior to final acceptance by the Contract Administrator.

MEASUREMENT AND PAYMENT

E57.15 The Unit prices submitted in the Bid shall include the entire cost of supplying all labor, material and equipment to supply and place in the Work, corrugated steel pipes as shown on the Drawings and specified in this Specification.

E57.16 Supply and installation of corrugated steel pipe culvert shall be measured and paid in accordance with CW 3610.

E57.17 Connections to existing culverts shall be measured and paid for in accordance with CW 3610.

E57.18 The removal of existing culverts shall be measured and paid for in accordance with E72.

CIVIL WORKS

E58. PIPELINE CROSSINGS

DESCRIPTION

E58.1 General

E58.1.1 This Specification covers all operations relating to the following Works:

(a) Construction equipment crossing Shell Canada Products Limited and Imperial Oil Limited pipeline.

(b) Installation of wastewater sewer and land drainage sewer under pipelines.

E58.1.2 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.

CONSTRUCTION METHODS

E58.2 The Contractor will be required to construct permanent road works/grading works along with construction access crossings over the existing buried pipelines. The existing pipelines that are known and shown on the Drawings are:

(a) Two Shell Canada Products Limited pipelines on the north side of the CN Redditt Subdivision Track;

(b) Two Imperial Oil Limited pipelines on the east side of Plessis Road south of the valve station; and

(c) One Imperial Oil Limited pipeline on the east side of Plessis Road north of the valve station.

E58.3 The Contractor is required to verify prior to construction the depth of existing underground pipelines by means of hydro-excavation in accordance with E21 shall be performed at a

minimum of one (1) point above each pipeline at each proposed construction access crossing location, at each utility crossing (wastewater sewer and land drainage sewers) and at various locations for the permanent road works/grading works as directed by the Contract Administrator.

E58.4 All hydro-excavations shall be backfilled with sand that is approved by the Contract Administrator.

E58.5 All construction access crossings shall be removed prior to or upon completion of the Work, to the satisfaction of the Contract Administrator.

E58.6 The Work required by the Contractor for each of the utility crossings are as follows:

E58.6.1 Oil Pipeline

(a) The Contractor is responsible to steel plate or place rig matting over the construction access crossings of the pipelines taking into account vehicle weight, wheel or track configuration, material size and utility depth of bury. The Contractor's design must be submitted to the Contract Administrator for approval in advance of any construction access crossings with a drawing showing the locations and depths of the pipes.

E58.6.2 Wastewater Sewer and Land Drainage Sewer Crossings

(a) Notify Contract Administrator a minimum of ten (10) days prior to commencement of work to arrange for a representative from the pipeline companies to be on-site. A representative from the pipeline companies will be required to be on-site during installation of the utility pipes under the pipelines to ensure there is no disruption to the pipeline.

(b) All backfill for the utility crossings at each pipeline crossing will be Class 4 backfill in accordance with standard City of Winnipeg Specifications. No vibratory compaction will be allowed within 3 m of the exposed pipelines.

E58.6.3 Permanent Road Works and Grading Works

(a) Notify Contract Administrator a minimum of ten (10) days prior to commencement of work to arrange for a representative from the pipeline companies to be on-site. A representative from the pipeline companies will be required to be on-site during construction of permanent road works/grading works that occur within 7.6m (25ft) of the pipelines.

(b) Maintain 2.0m cover over pipelines for construction equipment within 7.6m of the pipelines.

(c) Compaction of materials for road works/grading works within 3m (10ft) of the pipelines is to be completed with static rolling equipment. Vibratory compaction equipment within these limits will not be permitted.

MEASUREMENT AND PAYMENT

E58.7 Hydro-excavation to verify the depth of the pipelines is to be measured and paid for in accordance with E21.

E58.8 All other Items of Work covered by this Specification shall be incidental to the applicable type of Work and no additional payment shall be made.

E59. TRENCHLESS EXCAVATION

DESCRIPTION

E59.1 Further to Clause 3.4.1 of CW 2130, all underground utilities to be installed by trenchless methods are as shown on the Drawings. All crossings under the railway and existing roadways are to be installed by trenchless methods with the exception of the 1050 Dugald Drain Culverts as shown on the Drawings.

E59.2 Selection of excavation equipment for installation of sewers by trenchless methods shall be the responsibility of the Contractor and shall be made based on the basis of expected soil conditions outlined in the geotechnical report and as detailed on the soil logs. The Contractor shall make allowances in the choice of equipment to account for reasonable and minor deviations in ground conditions and shall have contingency plans for the removal of boulders and other minor changes in ground conditions.

E59.3 In the event that there is a substantial change in the character or nature of the subsurface conditions or that obstructions are encountered, which adversely impact the Contractor's production or construction procedure, the Contractor shall immediately notify the Contract Administrator.

E59.4 The notice shall provide details of the change in subsurface soil conditions or obstructions encountered, any proposed construction procedure revision that the Contractor intends to undertake, as well as any other relevant supporting information.

E59.5 The Contract Administrator shall review the notice as expeditiously as possible to assess whether the change in conditions and revised construction procedures amount to a Change in Work. In the case of obstructions due to boulders in the silt/till or hardpan strata where that stratum is evident in the soils logs, no consideration will be made for a Change in Work as boulder obstructions can be reasonably anticipated when working in this stratum. Obstructions such as "random boulders" in the clay strata well above the till interface may be considered as a Change in Work dependent on the level of effort required to facilitate their removal.

E59.6 Where the Contract Administrator deems that a Change in Work is necessary, it shall be valued in accordance with the provisions of GC: 7.

E60. TRENCHLESS EXCAVATION OBSTRUCTIONS

DESCRIPTION

E60.1 Contingency plans for removal of the obstructions encountered in trenchless excavations must be approved by the Contract Administrator and may consist of but not limited to one of the following.

(a) Drill or excavate a shaft at the location of the obstruction and remove the obstruction.

(b) Remove the obstruction through the jacking head or core hole following drilling, splitting or breaking the obstruction into smaller components as required.

(c) Other removal methods.

E60.2 Where the Contract Administrator deems that the obstruction encountered represents a Change in Work, it shall be valued in accordance with GC: 7.4 (c) and the following supplemental requirements:

E60.2.1 The first four (4) hours of handling obstructions for each occurrence shall be the responsibility of the Contractor.

E60.2.2 Equipment rates for equipment required in support of the obstruction removal shall be compensated at the MHCA rental rates. Equipment not listed in the MHCA rate schedule shall have their rates established by the Contractor prior to the commencement of Work in accordance with the procedure documented in the MHCA rental guide for establishing equipment rental rates and shall be subject to the approval of the Contract Administrator.

E60.2.3 Standby equipment that cannot reasonably be deployed elsewhere during the duration of the obstruction removal shall be compensated at 50% of its established rate as noted in E60.2.2 above.

E60.2.4 Labour rates and material costs associated with obstruction removal shall be compensated as per GC: 7.4 (c) and 7.4.1 with the provision that any removal and replacement of pavements shall be compensated at the Contract Unit Price for such Work.

E61. EXCAVATION, BEDDING AND BACKFILL

DESCRIPTION

E61.1 On-Site Disposal Excavated Material from Gravity Sewer Installation

(a) If the Contractor wishes to dispose of suitable excess material from the Gravity Sewer installation on-site in areas where clean fill is required for the embankments, the Contractor shall strip all organics to the satisfaction of the Contract Administrator prior to placement of the material.

E61.2 Disposal of Unsuitable or Surplus Excavated Material

E61.2.1 There shall be no measurement of surplus soil material disposed of at any disposal site. No additional payment will be made for disposal of surplus soil materials. It shall be considered incidental to the cost of the Work.

E61.3 Foundation, Bedding and Backfill

E61.3.1 Type 3 foundations shall be used in all shafts for trenchless excavations except as indicated by the Drawings.

E61.3.2 Type 3 bedding and initial backfill shall be used in place of sand in all shafts.

E61.3.3 All shafts located within paved areas of Dugald Road shall be backfilled with Class 1 Backfill as per SD-002.

E62. MAINTAINING EXISTING SEWER FLOWS, FLOW CONTROL, DIVERSIONS AND BYPASS PUMPING

DESCRIPTION

E62.1 Maintaining Existing Sewer Flows, Flow Control, Diversions and Bypass Pumping required to complete the Works in the Contract shall be incidental to the Contract as per Clause 4.16.1 of CW 2130.

E63. DITCH INLET GRATES

DESCRIPTION

E63.1 General

E63.1.1 This Specification covers the supply and installation of ditch inlet grates on catchbasins and catchpits.

E63.1.2 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.

MATERIALS

E63.2 General

E63.2.1 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.

E63.3 Ditch Inlet Grate

E63.3.1 All steel shall be supplied in accordance with details on the Drawings. All steel shall be hot dip galvanized and all hardware shall be stainless steel. Ditch Inlet Grates shall be Shopost Iron Works MK-A1 or approved equal in accordance with B8.

CONSTRUCTION METHODS

E63.4 Ditch Inlet Grates

E63.4.1 The Contractor shall be required to supply and install ditch inlet grates on drainage inlets shown on the Drawings.

E63.4.2 The ditch inlet grate shall be understood to include the supply and installation of all anchor steel, grate steel, and hardware. All concrete material shall be included in the unit price bid for the catch basins.

E63.4.3 The ditch inlet grate shall be securely fastened to the drainage inlets as shown on the Drawings and as approved by the Contract Administrator.

E63.4.4 Any galvanized surfaces that are damaged shall be coated with a galvanizing compound approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E63.5 Ditch Inlet Grates

E63.5.1 The supply and installation of ditch inlet grates will be incidental to “Catchbasins” that include Ditch Inlet Gates. No measurement and payment will be made for this Item of Work.

E64. GRAVITY SEWERS

DESCRIPTION

E64.1 General

(a) This Specification shall amend and supplement CW 2130 Gravity Sewers.

E64.1.1 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.

MATERIALS

E64.2 General

E64.2.1 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.

E64.3 Circular Flap Gates

E64.3.1 Flap gates, including frames, gates, hinges, pivot arms and fasteners, shall be constructed of Type 316 stainless steel to ASTM A240.

E64.3.2 Frame

(a) Shall be made of structural members or formed plate welded to form a rigid one-piece frame.

(b) Shall be flanged back.

(c) Frame for 250 mm diameter gate in Manhole W.12 shall be suitable for mounting on round 1,200 mm diameter manhole and with an extra wide flange for mounting over PVC piping.

E64.3.3 Gate shall be made of structural members or formed plate adequately reinforced to withstand seating head of 10 m without distortion.

E64.3.4 Seals shall be made of resilient neoprene attached to the body by means of a retainer ring.

E64.3.5 Hinges shall have stainless steel pin and ultra high molecular weight polyethylene bushing to ASTM D4020.

E64.3.6 Hinge arms shall be made of structural members or formed plates.

E64.3.7 An EPDM gasket shall be provided and installed between the frame and concrete mounting surface.

E64.3.8 Acceptable Product:

E64.3.9 Fontaine Series 60 Circular Flap Gates.

CONSTRUCTION METHODS

E64.4 Flap Gate Installation

E64.4.1 Where sluice and flap gates are to be installed, ensure the manhole wall is true and uniformly constructed within gate installation tolerances as specified by the gate manufacturer. High spots less than 6 millimetres in depth may be removed by grinding. Low areas shall be levelled with an approved epoxy grout.

MEASUREMENT AND PAYMENT

E64.5 Supply and Installation of Circular Flap Gates

E64.5.1 250 mm on Round Manhole Wall shall be measured on a unit basis and paid for per each at the Contract Unit price for “250mm Circular Flap Gate on Round MH Wall (MH.W12)”, 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.

E65. PRECAST DITCH INLET STRUCTURE

DESCRIPTION

E65.1 This Specification covers all operations relating to the installation of the new precast ditch inlet structures in the Dry Pond.

E65.2 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.

E65.3 Referenced Standard Construction Specifications

E65.3.1 CW 1130 – Site Requirements

E65.3.2 CW 2030 – Excavation Bedding and Backfill

MATERIALS

E65.4 General

E65.4.1 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.

E65.5 Precast Ditch Inlet Structure

E65.5.1 Supply precast ditch inlet structure as shown on the Drawings.

E65.6 Miscellaneous Metals

E65.6.1 Steel

(a) Structural steel shapes and accessories shall conform to CSA Standard G40.21-92, 300 MPa, except 350 MPa Class C for H.S.S. steel shapes, Grade W Structural Quality Steels (2C).

(b) All metal shall be free from scale, buckles, pits and other defects. All structural steel shall be hot dip galvanized upon completion of component fabrication.

E65.6.2 Fasteners

(a) Anchor bolts and other fasteners shall be stainless steel and shall conform to ASTM A276 Type 316 unless otherwise shown on the Drawings.

E65.6.3 Galvalloy

(a) Gallvalloy shall be 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.

E65.7 Miscellaneous Materials

E65.7.1 Supply all miscellaneous materials as noted on the Drawings.

E65.8 Backfill

E65.8.1 Backfill shall be in accordance with CW 2030, Class 2 backfill except compaction shall be to a density of 95% of the maximum dry density as determined by the Standard Proctor Compaction Test.

CONSTRUCTION METHODS

E65.9 Miscellaneous Metals

E65.9.1 Assembly

(a) Material intended for use in the various assemblies shall be straight, clean, sharply defined profiles, assembled in such a way that no disfigurements will show in the finished work, or impair the strength. Upon completion of fabrication and assembly, all exposed steel shapes shall be hot dip galvanized.

E65.9.2 Welding

(a) All steel welding shall conform to CSA Standard W.59-M1989. The fabricator shall be fully approved by the Canadian Welding Bureau, in conformance with CSA Standard W.47.1. Welding shall be done by currently licensed welders only. Welding spatter and other fabricator burrs where exposed shall be ground or filed smooth and left ready for subsequent operations.

E65.9.3 Hot Dip Galvanizing

(a) All exposed steel, after fabrication, shall be hot dip galvanized in accordance with the requirements of CAN/CSA G164-92 to a minimum net retention of 600 grams per square metre (2 oz./ft2).

E65.9.4 Galvalloy Procedure

(a) Areas of galvanizing damaged by field welding or otherwise shall be repaired by coating with Galvalloy material in accordance with the following procedure.

(b) The surface to be coated shall be treated to approximately 157oC (315oF) then rubbed with a bar of Galvalloy allowing a small amount to flow. The Galvalloy shall then be spread by brushing briskly with a wire brush, and brushed sufficiently to

obtain a bright finish. The process shall be repeated three times to ensure a proper thickness is achieved.

(c) Temperatures shall be kept below 177oC (350oF) at all times.

(d) All heating of structural steelwork shall be done in the presence of the Contract Administrator.

MEASUREMENT AND PAYMENT

E65.10 Precast Ditch Inlet Structure

E65.10.1 Construction of the precast ditch inlet structure shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for "Dry Pond Structure", 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. The proposed 1390 mm x 970 mm CSP connection to the inlet structure will be included in the lump sum payment.

E65.10.2 There shall be no additional measurement or payment for miscellaneous materials for the ditch inlet structure. It shall be included in payment for precast ditch inlet structure.

E65.10.3 There shall be no measurement or payment for excavation, base or backfill. These items shall be included in payment for the precast ditch inlet structure.

E66. PRIVATELY OWNED FORCEMAIN RENEWAL

DESCRIPTION

E66.1 This Specification covers all operations relating to the renewal of the 150 mm diameter privately owned forcemain in the Plessis Road right-of-way south of Dugald Road.

E66.1.1 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.

MATERIALS

E66.2 General

E66.2.1 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.

E66.3 Supply pipe and fittings in accordance with CW 2110 – R11.

CONSTRUCTION METHODS

E66.4 Construction shall be in accordance with CW 2110 – R11.

E66.5 Hydrostatic Leakage Testing

E66.5.1 Hydrostatic leakage testing shall be in accordance with CW 2125 – R4.

MEASUREMENT AND PAYMENT

E66.6 Forcemain Installation

E66.6.1 Forcemain installation will be measured on a length basis for each method of installation, type of bedding and type of backfill and paid for at the Contract Unit Price per metre for "150 mm PVC DR 18 C900 FRM c/w Bends", 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.

E66.7 Supply and Installation of Bends and Other Fittings

E66.7.1 Supply and installation of bends and other fittings will be measured on a unit basis and paid for in the Contract Unit Price per each for "150 mm PVC DR 18 C900 FRM c/w Bends", 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.

E66.8 Connecting New to Existing Forcemains

E66.8.1 Connecting new forcemains to existing forcemains will be measured on a unit basis and paid for at the Contract Unit Price per each for the "150 mm PVC DR 18 C900 to 150 mm FRM", 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.

E66.8.2 There shall be no additional measurement or payment for couplings for the connection. It shall be included in payment for the connection.

E66.9 Connecting New Forcemains to Existing Manholes

E66.9.1 Connecting new forcemains to existing manholes will be measured on a unit basis and paid for at the Contract Unit Price per each 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, accepted and measured by the Contract Administrator.

(a) Items of Work

i) 150 mm FRM (MH0733)
ii) 250 mm (MH7984)
iii) 450 mm (MH.W4)

E67. REMOVAL OF EXISTING ASBESTOS CEMENT WATERMAINS AND APPURTENANCES

DESCRIPTION

E67.1 General

E67.1.1 This Specification covers all operations relating to the removal of the existing 200 mm and 450 mm asbestos cement watermain.

E67.1.2 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.

CONSTRUCTION METHODS

E67.2 The Contractor shall remove and dispose of all existing asbestos cement watermains within the footprint of the underpass and new dry pond excavations.

E67.3 The Contractor shall follow the "job specific safe work plan" described in D18.

MEASUREMENT AND PAYMENT

E67.4 Asbestos cement watermain removals will be measured on a length basis and paid for at the Contract Unit Price per metre for "Items of Work" listed herein 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, accepted and measured by the Contract Administrator. Removal of fittings, valves, hydrants and other appurtenances associated with the watermains shall be incidental to the "Items of Work" and no additional payment will be made.

(a) Items of Work

(i) Removal of Abandoned 200 mm Asbestos Cement Watermain

(ii) 450 mm Abandoned Asbestos Cement Watermain

E68. REMOVAL OF EXISTING NON-ASBESTOS CEMENT WATERMAINS, SEWERMAINS, SEWER SERVICE PIPE AND APPURTENANCES

E68.1 DESCRIPTION

E68.2 General

E68.2.1 This Specification covers all operations relating to the removal of existing non-asbestos cement watermains, sewermains, sewer service pipe and appurtenances that are within the footprint of the underpass.

E68.2.2 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.

CONSTRUCTION METHODS

E68.3 The Contractor shall remove and dispose of all existing non-asbestos cement watermains, sewermains, sewer service pipes and appurtenances within the footprint of the underpass and new dry pond excavation.

MEASUREMENT AND PAYMENT

E68.4 Non-Asbestos Cement Watermain Removal

E68.4.1 Non-asbestos cement watermain removal will be measured on a length bases for each size and paid for at the Contract Unit Price per metre for “Non-Asbestos Cement Watermain Removal”, 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..

E68.5 Sewermain Removal

E68.5.1 Sewermain removal will be measured on a length basis for each size and paid for at the Contract Unit Price per metre for “Sewermain Removal”, 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..

E68.6 Sewer Service Pipe Removal

E68.6.1 Sewer Service Pipe removal will be measured on a length basis for each size and paid for at the Contract Unit Price per metre for “Sewer Service Pipe Removal”, 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.

E69. INSULATION OF EXISTING WATERMAINS AT CATCH PITS

DESCRIPTION

E69.1 General

E69.1.1 This Specification covers all operations relating to the insulation of watermains where a catch pit will be installed in the vicinity of existing watermain.

E69.1.2 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.

CONSTRUCTION METHODS

E69.2 Further to CW 2110 – R11 and SD-018, the Contractor shall modify the insulation to accommodate the installation of the catch pits in the vicinity of existing watermains as per the details shown on the Drawings.

MEASUREMENT AND PAYMENT

E69.3 Catch Pit Insulation

E69.3.1 Catch Pit Insulation will be measured on a unit basis and paid for at the Contract Unit Price per each for "Catch Pit Insulation", 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.

E70. HEAT TRACE POWER SUPPLY, HEAT TRACE CABLE AND INSULATED PIPE

DESCRIPTION

E70.1 General

E70.1.1 This Specification covers all operations relating to the supply and installation of the heat trace power supply, heat trace cable and insulated pipe.

E70.1.2 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.

E70.2 The heat trace system shall service the sewer service pipes as shown on the Drawings and be supplied with power from the Pumping Station. A junction box shall be located inside CB.32 containing the temperature sensors used to control the heat trace cable.

MATERIALS

E70.3 General

E70.3.1 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.

E70.4 Materials as specified on the Drawings.

E70.5 The junction box containing the temperature sensors inside CB.32 shall be explosion proof and rated for Class 1 Zone 1 environment.

CONSTRUCTION METHODS

E70.6 The heat trace power supply shall be installed between the traffic barrier and the retaining wall cladding as shown on the Structural Drawings.

MEASUREMENT AND PAYMENT

E70.7 Pre-Insulated Sewer Service Pipe

E70.7.1 Pre-insulated sewer service pipe will be measured on a length basis for each size, pipe material type and paid for at the Contract Unit Price per metre for Pre-insulated Sewer

Service Pipe, 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.

E70.8 Heat Trace Cable And Power Supply System

E70.8.1 Heat trace cable and power supply system will be measured on a unit basis and paid for at the Contract Unit Price per each for "Heat Trace Cable System for SSP", 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.

E71. INSTALLATION OF CULVERTS

DESCRIPTION

E71.1 General

E71.1.1 This Specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3610-R3 "Installation of Culverts", and covers all operations relating to the supply and installation of culverts.

E71.1.2 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.

E71.1.3 Referenced Standard Construction Specifications

(a) CW 2030-R7 – Excavation Bedding and Backfill

(b) CW 3610-R3 – Installation of Culverts

E71.1.4 Referenced Standard Detail

(a) SD 002 – Standard Trench and Excavation Backfill Classes.

MATERIALS

E71.2 General

E71.2.1 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.

E71.3 Bedding and Backfill

E71.3.1 Bedding and initial backfill material shall consist of 20 mm limestone base, as specified in CW 2030-R7, placed on a prepared subgrade and compacted to the thickness and density herein specified.

CONSTRUCTION METHODS

E71.4 Bevelled Ends

E71.4.1 Further to CW 3610-R3, all CSP culvert ends shall be bevelled as shown on the Drawings.

E71.5 Bedding and Backfill

E71.5.1 The backfilling for culverts installed under proposed pavements and private approaches shall be Class 2 as shown in Standard Detail SD-002 and specified in CW 2030-R7, except as noted below.

E71.5.2 The following revisions for bedding and initial backfill apply to Class 2 and Class 4 backfill:

(a) Limestone base material as previously specified shall be used for bedding and initial backfill as opposed to sand.

(b) A minimum thickness of 225 mm of compacted 20 mm limestone bedding shall be placed on the prepared subgrade. A 75 mm blanket of loose uniform bedding material shall then be placed on the compacted bedding to provide fill for the corrugations in the invert.

(c) The backfill material shall be placed in layers not exceeding 300 mm. Backfilling shall be carried out in such a manner as to obtain uniform compaction without soft spots. Compaction shall be 95% of the Standard Proctor Density.

(d) Manual placing and compaction of material shall be used to build up the backfill to encompass the lower part of the pipe. Backfill material shall be placed under the haunches by shovel and compacted firmly by power compaction ("jumping jack") equipment. Valleys of the corrugations and the area immediately next to the pipe must be compacted by hand operated methods. At no time shall heavy compaction equipment be brought closer than 1 m from the CSP.

(e) Backfill shall be so placed and mechanically compacted that the fill rises equally and simultaneously on both sides, including handwork next to the pipe. Layers shall be placed with equipment running parallel to the structure.

(f) When the fill on both sides of the pipe approaches the crown of the pipe, the same techniques of spreading shallow layers and compacting thoroughly shall be followed as the backfill covers the pipe. Light tamping equipment shall be used for the initial layers over the pipe.

(g) No distortion of the structure greater than 2% of the span or rise shall be allowed.

(h) No traffic of any sort shall be permitted over the structure until cover of a minimum depth of 300 mm is properly compacted in place. If the Contractor requires crossings by heavy construction equipment, a minimum of 0.6 m of compacted cover over a length of at least 7.3 m of the structure shall be provided at no extra cost to the City.

(i) All compaction equipment used shall be subject to the approval of the Contract Administrator.

MEASUREMENT AND PAYMENT

E71.6 Supply and Installation of Culverts

E71.6.1 The supply and installation of culverts will be measured and paid for in accordance with CW 3610-R3.

E71.6.2 Bevelled ends will be considered incidental to the Supply and Installation of Culverts. No measurement and payment will be made for this Item of Work.

E72. REMOVAL AND ABANDONMENT OF EXISTING CULVERTS AND SUBDRAINS

DESCRIPTION

E72.1 General

E72.1.1 This Specification covers the removal and abandonment of existing culverts and subdrains.

E72.1.2 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.

E72.1.3 Referenced Standard Construction Specifications

(a) CW 2030-R7 – Excavation Bedding and Backfill

CONSTRUCTION METHODS

E72.2 Removal of Existing Culverts

E72.2.1 The Contractor shall remove and salvage existing culverts designated for removal within the limits of the Contract and as shown on the Drawings.

E72.2.2 The excavation for the removal of existing culverts outside of proposed pavements shall be backfilled to Class 4 standards in accordance with CW 2030-R7. The excavation for removal of existing culverts under proposed pavements shall be backfilled to Class 2 standards in accordance with CW 2030-R7.

E72.2.3 The culverts shall be removed so as not to damage the pipe sections. Where culverts are coupled, the sections shall be separated prior to removal.

E72.2.4 Culverts that are deemed unsalvageable or surplus by the Contract Administrator shall be removed and disposed of off-site.

E72.3 Culvert Abandonment

E72.3.1 The Contractor shall supply and install cement-stabilized flowable fill, filling from both ends of the culvert to completely fill the interior.

E72.4 Removal of Existing Subdrains

E72.4.1 The Contractor shall remove and dispose of existing subdrain piping designated for removal within the limits of the Contract and as shown on the Drawings.

E72.4.2 The excavation for the removal of existing subdrain piping outside of proposed pavements shall be backfilled to Class 4 standards in accordance with CW 2030-R7. The excavation for removal of existing subdrain piping under proposed pavements shall be backfilled to Class 2 standards in accordance with CW 2030-R7.

MEASUREMENT AND PAYMENT

E72.5 Removal of Existing Culverts

E72.5.1 The removal of existing culverts will be measured on a length basis and paid for at the Contract Unit Price per meter for “Removal of Existing Culverts”, 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.

E72.5.2 Salvaging for reuse and disposal of the surplus culverts shall be included in payment for “Removal of Existing Culverts” and no further payment shall be made.

E72.5.3 Removal of existing culverts in locations where new culverts are to be installed shall be considered incidental to the installation of the new culvert.

E72.6 Culvert Abandonment

E72.6.1 Culvert abandonment will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Abandoning Existing LDS with Cement Stabilized Fill”, 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.

E72.7 Removal of Existing Subdrains

E72.7.1 The removal of existing subdrain piping will be measured on a length basis and paid for at the Contract Unit Price per meter for “Removal of Subdrains”, 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.

E73. INSTALLATION OF THE SEWER SERVICE PIPE THROUGH THE RETAINING WALL

DESCRIPTION

E73.1 General

E73.1.1 This Specification covers the installation of the sewer service pipe through through the retaining wall.

E73.1.2 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.

MATERIALS

E73.2 General

E73.2.1 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.

E73.3 Materials as specified on the Drawings.

CONSTRUCTION METHODS

E73.4 The 500 mm x 450 mm slotted hole through the retaining wall shall be constructed in accordance with E33.

E73.5 The sewer service pipe shall cross at a perpendicular angle through the center line of a section of retaining wall. MH.L20 and CB.35 may be adjusted as required to achieve the latter upon approval of the Contract Administrator.

E73.6 The sewer service pipe and casing pipe shall be centered in the 500 mm hole through the retaining wall, as shown on the Drawings.

E73.7 Joints on the sewer service pipe shall be located 300 mm from the ends of the casing pipe, as shown on the Drawings.

MEASUREMENT AND PAYMENT

E73.8 Installation Of The Sewer Service Pipe Through The Retaining Wall

E73.8.1 The installation of the sewer service pipe through the retaining wall shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “300 SSP Installation Thru Retaining Wall c/w 400 mm Steel Casing and End Seals”, 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.

E73.8.2 Construction of the 500 mm x 450 mm slotted hole through the retaining wall will be considered incidental to the Works of this Specification. No measurement and payment will be made for these Items of Work

ROAD WORKS

E74. CRASH ATTENUATION BARRIER

DESCRIPTION

E74.1 The Work covered under this item shall include all operations related to the supply, fabrication, delivery and installation of the new Crash Attenuation Barrier.

E74.2 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 the Work as hereinafter specified.

MATERIALS

E74.3 General

E74.3.1 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.

E74.4 Crash Attenuation Barriers shall be non-gating crash cushions conforming to NCHRP 350, TL-3. Approved products are Quadguard or Quadguard II, as supplied by Energy Absorption Systems, or TAU-II, as supplied by Barrier Systems. The Crash Attenuation Barrier shall include an extension panel that extends past the obstruction.

E74.5 Materials shall be supplied in accordance with the manufacturer's product manual to accommodate a 80 kph design speed.

Please refer to:

(a) Quadguard Installation Manual

(b) TAU-II Installation Manual

CONSTRUCTION METHODS

E74.6 The Crash Attenuation Barriers shall be installed in accordance with the manufacturer's installation manual.

Please refer to:

(a) Quadguard Installation Manual

(b) TAU-II Installation Manual

MEASUREMENT AND PAYMENT

E74.7 Supply and Installation of Crash Attenuation Barrier

E74.7.1 Supply and Installation of Crash Attenuation Barrier, including all product materials, will be measured for payment on a Lump Sum basis and paid for at the Contract Unit Price for "Supply and Installation of Crash Attenuation Barrier".

E75. ROADWAY EXCAVATION AND SUITABLE SITE MATERIAL

DESCRIPTION

E75.1 General

E75.1.1 This Specification covers all operations relating to the removal of excavation material, contaminated material, placing of suitable site material and disposal of contaminated water within the project site as approved by the Contract Administrator.

E75.1.2 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.

E75.2 This Specification shall supplement the COW Specification for Earthwork and Grading CW 3170.

MATERIALS

E75.3 General

E75.3.1 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.

E75.4 Suitable site material as per City of Winnipeg CW 3170.

E75.5 Contaminated materials currently identified on-site have been located in a small quantity. The test results for this material can be found in Appendix E.

E75.5.1 Laboratory analytical results indicate detectable concentrations of Petroleum Hydrocarbon (PHC) Fractions and benzene from a soil samples collected from approximately 5 m below grade. The PHC and benzene concentrations are below the applicable CCME Soil Quality Guidelines (in situ). Metals (copper and lead) were also detected at concentrations above the applicable CCME Soil Quality Guidelines for commercial land use.

CONSTRUCTION METHODS

E75.6 Excavation

E75.6.1 As per City of Winnipeg Specification CW 3170.

E75.7 Excavation/Disposal of Contaminated Material and Collection of Contaminated Water

E75.7.1 Excavate test pits, in locations and to extents as directed by the Contract Administrator, in advance of subsurface construction works, including but not limited to, utilities, Pumping Station, underpass and roadways. Allow the Contract Administrator to sample the soil and any accumulated groundwater for analysis of potential contaminants of concern. Test pits will be backfilled with the excavated material following the collection of soil/groundwater samples. Based on the soil and groundwater sampling analytical results, soil requiring removal, transport and disposal or water (groundwater or water collected within excavated areas) requiring collection and disposal will be identified by the Contractor Administrator.

E75.7.2 Contaminated water is to be treated and disposed of in accordance with all Federal, Provincial and Municipal laws, regulations, and by-laws. Do not discharge dewatered groundwater or other water which may have come into contact with potentially contaminated material, off-site or to municipal sewers, without the approval of the Contract Administrator.

E75.8 Placement of Suitable Site Material

E75.8.1 As per City of Winnipeg Specification CW 3170.

E75.8.2 Placement of suitable site material shall be performed at locations approved by the Contract Administrator. Suitable site material shall be utilized at the locations specified below.

(a) Low lying area to the northeast of the Dugald and Plessis intersection adjacent to 2125 Dugald Road East Side Self Storage,

(b) Plessis Road south of the Dugald Road and Plessis Road intersection, within areas of proposed rural cross-section. Material will be utilized to widen existing roadway embankment and fill existing drainage ditches.

(c) Dugald Road within areas of proposed rural cross-section. Material will be utilized to widen existing roadway embankment and fill existing drainage ditches.

E75.8.3 Remaining excavated material will be removed from site in accordance with CW 3170 and this Specification.

E75.9 Removal of abandoned Manitoba Hydro gas lines, MTS lines and MTS manholes that fall within the excavations of the site will be considered incidental to works of this Specification.

MEASUREMENT AND PAYMENT

E75.10 Excavation

E75.10.1 Excavation of roadway and ditch material will be measured on a volume basis and paid for at the Contract Unit Price per cubic meter for "Excavation", 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. No additional payment will be made to the Contractor for double handling of material unless previously agreed to by the Contract Administrator, nor will additional payment be made for any length of haul distance within the project site, regardless of the length of haul should an excess of material at one end of the project be needed at the opposite end.

E75.10.2 Excavation, removal and disposal of contaminated soil will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Excavate, Transport and Disposal of Contaminated Soil", 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.

E75.11 Removal and Disposal of Contaminated Water

E75.11.1 Removal and disposal of contaminated groundwater to be disposed off-site will be measured by volume and paid for at the Contract Unit Price per Litre for "Off-Site Disposal of Contaminated Water", 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.

E75.12 Excavation and Backfilling of Test Pits

E75.12.1 Excavation and backfilling of test pits will be measured on a time basis and paid for at the Contract Unit Price per hour for "Excavate and Backfill Test Pits", 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.

E75.13 Removal of Abandoned Utilities

E75.13.1 Removal of abandoned utilities as per E75.9 will be considered incidental to the Works of this Specification. No measurement and payment will be made for these Items of Work.

E76. CORRUGATED STEEL PIPE REMOVAL

DESCRIPTION

E76.1 General

E76.1.1 This Specification covers all operations relating to the removal of corrugated steel pipes of various sizes and lengths.

E76.1.2 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.

CONSTRUCTION METHODS

E76.2 Remove corrugated steel pipes in accordance with the contract drawings or as directed by the Contract Administrator.

E76.3 Cut, tear or fold steel as required to reduce corrugate steel pipes to a suitable size for removal from site.

E76.4 Dispose of material in accordance with Section 3.4 of CW 1130.

MEASUREMENT AND PAYMENT

E76.5 Corrugated Steel Pipe Removal will be measured by length on a linear meter basis and paid for at the Contract Unit Price per meter as "Corrugated Steel Pipe Removal", 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.

E77. TRANSITION CURB

DESCRIPTION

E77.1 General

E77.1.1 This Specification supplements the latest version of the City of Winnipeg Standard Construction Specification CW 3310 and covers the installation of "transition" curb adjacent to the underpass shoulder barrier as shown on the contract drawings. This curb transitions between the separate barrier curb and the 100mm height lip curb.

E77.1.2 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.

E77.2 Referenced Standard Construction Specifications

E77.2.1 The latest version of the City of Winnipeg Standard Construction Specification CW 3310 – Portland Cement Concrete Pavement Works

E77.3 Referenced Standard Details

E77.3.1 SD-203A – Barrier Curb (Separate)

E77.3.2 SD-202A – 75mm Lip Curb

MATERIALS

E77.4 General

E77.4.1 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.

E77.5 In accordance with the latest version of the City of Winnipeg Standard Construction Specification CW 3310, Section 5.

CONSTRUCTION METHODS

E77.6 Transition Curb Installation

E77.6.1 Separate transition curb with dimensions as shown on the contract drawings is to be installed in accordance with the latest version of the City of Winnipeg Standard CW 3310, Section 9 and SD-203A, complete with reinforcement.

E77.7 Quality Control

E77.7.1 Inspection

(a) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection 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 approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E77.7.2 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.

MEASUREMENT AND PAYMENT

E77.8 Transition Curb Installation

(a) Transition Curb Installation will be measured on a length basis and paid for at the Contract Unit Price per metre for "Construction of Barrier (180 mm ht, Separate)" 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.

E78. REMOVAL, SALVAGE AND INSTALLATION OF FENCING

DESCRIPTION

E78.1 General

E78.1.1 This Specification covers the removal, salvaging and installation of chain link fencing.

E78.1.2 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.

E78.1.3 Referenced Standard Construction Specifications

(a) CW 3550 - Chain Link Fencing

MATERIALS

E78.2 General

E78.2.1 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.

E78.3 Barbed Wire

E78.3.1 Barbed wire shall be 2 mm diameter galvanized steel wire to ASTM A121, 4 point barbs with 125 mm spacing.

CONSTRUCTION METHODS

E78.4 Installation Chain Link Fencing using Salvaged Materials.

E78.4.1 Install chain link fence in accordance with CW 3550 using salvaged materials.

E78.4.2 New fence posts shall be supplied and installed to match the removed posts.

E78.4.3 Supply and install 3 strand barbed wire, where the existing fence had barbed wire, 0.300 m high on top of the installed fence at the same angle that existing barbed wire was.

E78.4.4 Chain link fence shall be installed prior to removal and salvage of existing chain link fence to maintain security at 2125 Dugald Road (East Side Self Storage) and 2129 Dugald Road (Big Freight Systems Inc).

E78.4.5 The Contractor shall have limited access to both properties. The Contractor is to notify the Contract Administrator a minimum of 48 hours in advance to arrange for access to the properties.

E78.5 Removal and Salvage of Existing Chain Link Fence.

E78.5.1 Existing chain link fencing designated for removal shall be carefully removed and salvaged. All chain link fencing components and all hardware shall be salvaged for reuse and stockpiled at locations designated by the Contract Administrator for reinstallation in Contract 3.

E78.5.2 The Contractor shall remove the fence posts and concrete bases. The post holes remaining following the removal of the fencing shall be backfilled and compacted to the satisfaction of the Contract Administrator. All concrete rubble shall be removed and disposed of by the Contractor.

E78.5.3 In the event of damage to any materials by the Contractor, the Contractor shall immediately notify the Contract Administrator and make all repairs or replacements necessary, at his own expense, to the satisfaction of the Contract Administrator.

E78.6 Removal and Salvage of Existing Chain Link Fence

E78.6.1 The Contractor shall remove and dispose of chain link fence, posts and concrete bases. The post holes remaining following the removal of the fencing shall be backfilled and compacted to the satisfaction of the Contract Administrator. All concrete rubble shall be removed and disposed of by the Contractor.

E78.7 Removal of Existing Chain Link Fence

E78.7.1 The Contractor shall remove and dispose of chain link fence, posts and concrete bases. The post holes remaining following the removal of the fencing shall be backfilled and compacted to the satisfaction of the Contract Administrator. All concrete rubble shall be removed and disposed of by the Contractor.

MEASUREMENT AND PAYMENT

E78.8 Install Chain Link Fence using Salvaged Materials.

E78.8.1 The installation of chain link fences will be measured on a length basis and paid for at the Contract Unit Price per metre for “Install Chain Link Fence-Salvaged Materials”, 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.

E78.8.2 The cost of supplying barbed wire and new posts will be considered incidental to the Works of this Specification. No measurement and payment will be made for this Work.

E78.9 Remove and Salvage Chain Link Fence

E78.9.1 The removal and salvaging of existing chain link fences will be measured on a length basis and paid for at the Contract Unit Price per metre for "Remove and Salvage Chain Link Fence", 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.

E78.9.2 The cost of backfilling post holes and removing and disposing of old fence posts and concrete rubble will be considered incidental to the Works of this Specification. No measurement and payment will be made for this Work.

E78.10 Removal of Existing Chain Link Fence

E78.10.1 The removal of and dispose of existing chain link fences will be measured on a length basis and paid for per metre at the Contract Unit Price for "Chain Link Fence Removal", 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.

E78.10.2 The cost of backfilling post holes and removing concrete rubble will be considered incidental to the Works of this Specification. No measurement and payment will be made for this Work.

E79. CRACK SEALING INTERFACE OF CURB AND GUTTER/ASPHALT PAVEMENT

DESCRIPTION

E79.1 General

E79.1.1 This Specification covers all operations relating to the crack sealing interface of curb and butter/ashalt pavement.

E79.1.2 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.

E79.2 Further to D26.1 the Contractor shall crack seal the interface of the curb and gutter/asphalt pavement one year after the construction of the asphalt pavement and curb and gutter is completed.

MATERIALS

E79.3 General

E79.3.1 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.

E79.4 Joint sealant shall be supplied as per CW 3250.

CONSTRUCTION METHODS

E79.5 Crack sealing of the interface shall be completed using joint sealant in accordance with Clause 3 of CW 3250.

MEASUREMENT AND PAYMENT

E79.6 Crack Sealing the Interface of Curb and Gutter/Asphalt Pavement

E79.6.1 Crack sealing the interface of Curb and Gutter/Asphalt Pavement will be measured on a length basis and paid for at the Contract Unit Price per metre for "Crack Sealing" regardless of the width of the crack, 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.

E80. NEW CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

DESCRIPTION

E80.1 General

E80.1.1 The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations in accordance with this Specification and as shown on the Drawings.

E80.1.2 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.

MATERIALS

E80.2 General

E80.2.1 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.

E80.3 Handling and Storage of Materials

E80.3.1 Storage of materials shall be in accordance with CSA Standard A23.1-09.

E80.4 Testing and Approval

E80.4.1 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.

E80.4.2 All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E80.5 Patching Mortar

E80.5.1 The patching mortar shall be made of the same cementitious 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 and placing.

E80.6 Cement

E80.6.1 Cement shall be Type HS or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of CSA Standard A23.1-09.

E80.7 Concrete

E80.7.1 General

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

E80.7.2 The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1-09:

(a) Class of Exposure: S-1

(b) Compressive Strength @ 56 days = 35 MPa

(c) Water / Cementing Materials Ratio = 0.4

(d) Air Content: Category 2 per Table 4 of CSA A23.1-09 (4-7%)

(e) Cement – shall be as specified in E80.6.

E80.7.3 Mix design for ready mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.

E80.7.4 The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for pile foundations.

E80.7.5 Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.

E80.7.6 The temperature of all types of concrete shall be between 15˚C and 25˚C at discharge. Temperature requirements for concrete containing silica fume shall be between 10˚C and 18˚C at discharge unless otherwise approved by the Contract Administrator.

E80.7.7 Concrete materials susceptible to frost damage shall be protected from freezing.

E80.8 Aggregate

E80.8.1 The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with CSA A23.1.

E80.8.2 Coarse Aggregate

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

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

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

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

(e) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E80.8.3 Fine Aggregate

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

(b) 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.

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

E80.9 Cementing Materials

E80.9.1 Cementing materials shall conform to the requirements of CSA A3001.

E80.9.2 Silica Fume

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

E80.9.3 Fly Ash

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

E80.9.4 Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening or formation of lumps shall not be used in the Work.

E80.10 Admixtures

E80.10.1 Air entraining admixtures shall conform to the requirements of ASTM C260.

E80.10.2 Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

E80.10.3 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.

E80.10.4 Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.

E80.10.5 An aminocarboxylate based migrating corrosion inhibitor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject to the approval of the Contract Administrator.

E80.11 Water

E80.11.1 Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

E80.12 Concrete Supply

E80.12.1 Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.

E80.12.2 Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within 90 minutes after the introduction of the mixing water to the cementing materials and aggregates.

E80.12.3 The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E80.13 Reinforcing Steel

E80.13.1 Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

E80.13.2 All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new

deformed billet steel bars. All bars, including ties, shall be hot-dip galvanized in accordance with ASTM A767 for a minimum net retention of 610 g/m2. Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E80.14 Anchor Bolts, Nuts, and Washers

E80.14.1 Anchor bolts, nuts, and washers shall be in accordance with ASTM F1554, and shall be hot-dip galvanized full length in accordance with ASTM F2329 for a minimum net retention of 610 g/m2, for the entire length of the anchor bolts. The threaded portion of the anchor bolts shall be 300 mm long. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E80.15 Anchor Bolt Templates

E80.15.1 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.

E80.16 Miscellaneous Materials

E80.16.1 Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

CONSTRUCTION METHODS

E80.17 Location and Alignment of Piles

E80.17.1 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.

E80.17.2 Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.

E80.17.3 The deviation of the axis of any finished pile shall not differ by more than 1 percent from the vertical.

E80.18 Buried Utilities

E80.18.1 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.

E80.18.2 The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.

E80.18.3 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.

E80.19 Excavation

E80.19.1 Pile excavation shall be achieved by auguring (i.e. drilling) or hydro-jet excavation for the full depth of all piles.

E80.19.2 It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough “slack” in conduits to move them slightly to avoid interference with the pile locations. The Contract Administrator may elect to alter the location of a pile if hydro-jet excavation shows that utilities cannot be avoided.

E80.19.3 Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.

E80.19.4 All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.

E80.19.5 Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.

E80.19.6 If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole excavated as near as possible to the location shown on the Drawings. In locations where underground utilities have been exposed, the underground utilities shall be covered with clean sand to 300 mm minimum cover around the utility. Payment will not be made for condemned piles.

E80.20 Sleeving

E80.20.1 Steel or corrugated metal pipe sleeving shall be used to temporarily line the excavation to prevent bulging or caving of the walls and to protect men at work in the excavation.

E80.20.2 The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

E80.20.3 The sleeving shall be withdrawn as the concrete is placed in the excavation. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.

E80.20.4 The clearance between the face of the excavation and the sleeving shall not exceed 75 mm.

E80.20.5 The sleeving may remain cast in place if required to protect nearby utilities at the direction of the Contract Administrator. The top of sleeving shall be 300 mm below the top of sidewalk.

E80.21 Inspection of Excavations

E80.21.1 Concrete shall not be placed in an excavation until the excavation has been inspected and approved by the Contract Administrator.

E80.21.2 The Contractor shall have available suitable light for the inspection of each excavation throughout its entire length.

E80.21.3 Any improperly set sleeving or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E80.22 Placing Reinforcing Steel

E80.22.1 Reinforcement shall be:

(a) placed in accordance with the details shown on the Drawings

(b) rigidly fastened together, and

(c) lowered into the excavation intact before concrete is placed.

E80.22.2 Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E80.23 Placing Anchor Bolts

E80.23.1 The anchor bolts shall be aligned with a steel template matching the bolt holes in the sign structure base plate. The setting template shall be held in place by the top and bottom nuts of the anchor bolts. 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.

E80.23.2 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.

E80.24 Forms

E80.24.1 For “hydro-jet excavated” piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 mm below final grade.

E80.24.2 For bored piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 mm below final grade.

E80.24.3 In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform. The minimum depth of the tubular forms (Sonotube) shall be as specified by E80.24 (a).

E80.24.4 The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.

E80.25 Placing Concrete

E80.25.1 Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts and conduits are properly positioned prior to placement of concrete.

E80.25.2 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.

E80.25.3 Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be finished smooth and even with a hand float.

E80.25.4 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. In the event that tremie concrete is allowed by the Contract Administrator, the concrete shall be placed as specified herein.

E80.25.5 All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations 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 that may cause honeycombing, pitting, or planes of weakness.

E80.26 Tremie Concrete

E80.26.1 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.

E80.26.2 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.

E80.27 Protection of Newly Placed Concrete

E80.27.1 Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E80.28 Curing Concrete

E80.28.1 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.

E80.28.2 After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

E80.28.3 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.

E80.28.4 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.

E80.29 Form Removal

E80.29.1 Forms shall not be removed for a period of at least 24 hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

E80.29.2 The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

E80.29.3 Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E80.30 Patching of Formed Surfaces

E80.30.1 Immediately after forms around top of pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed.

E80.30.2 All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

E80.30.3 Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be well-brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E80.31 Cold Weather Concreting

E80.31.1 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 his own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.

E80.32 Removal and Restoration of Adjacent Surface Treatments

E80.32.1 If the new pile being constructed is located in a concrete sidewalk/median slab, the existing slab shall be removed to the nearest existing joints. If the nearest existing joint is more than 600 mm beyond the perimeter of the pile, the Contractor shall remove a square section of the existing slab that is 300 mm beyond the pile perimeter. The surface of the slab shall be saw-cut to a depth of 50 mm around the perimeter of the square section. Care shall be taken to ensure that the saw-cut edge of the section is not chipped or broken during the removal of the concrete. Concrete slabs damaged beyond the specified limits

shall be replaced at the Contractor's cost to the satisfaction of the Contract Administrator. After the pile has been constructed, the concrete sidewalk/median slab shall be restored flush with the adjacent surface level.

E80.32.2 If the pile being constructed is located in grass boulevard/median, following pile construction disturbed areas shall be backfilled and restored with sod around the new pile as directed by the Contract Administrator

E80.32.3 If the pile being constructed is located in a paving stone surface, the paving stones shall be temporarily removed to the extent required for new pile construction and appropriately stored by the Contractor. Following pile construction, the Contractor shall cut as required and re-set the salvaged paving stones around the new pile flush with the adjacent surface level, as directed by the Contract Administrator.

E80.32.4 The removal and restoration of surface treatments will be considered incidental to pile construction works at each Site and no separate payment will be made.

E80.33 Quality Control

E80.33.1 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.

E80.33.2 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.

MEASUREMENT AND PAYMENT

E80.34 Construction of New Cast-in-Place Concrete Pile Foundations

E80.34.1 Construction of new cast-in-place concrete pile foundations including supply and installation of anchor bolts and steel template will be measured on a unit basis and paid for at the Contract Unit Price per each for "Cast-in-Place Concrete Pile Foundations" 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, accepted and measured by the Contract Administrator.

(a) S776, 610 mm Diameter Pile

E81. EAST SIDE SELF STORAGE FILL AND GRANULAR MATERIAL

DESCRIPTION

E81.1 General

E81.1.1 This specification shall supplement the COW specification for Earthwork and Grading CW 3170, E53 and E75.

E81.1.2 This specification covers all operations relating to the roadway excavation and stockpile of suitable site material and the removal and stockpile of shoo-fly sub- base/sub-ballast material for East Side Self Storage as approved by the Contract Administrator.

E81.1.3 The Work to be done by the Contractor under this Specification shall include the supply of all materials, and the furnishing of all superintendence, overhead, labour, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

CONSTRUCTION METHODS

E81.2 Roadway Excavation and Stockpile of Suitable Site Material

E81.2.1 As per City of Winnipeg Specification CW 3170 and E75.

E81.2.2 Approximate quantity of suitable site material required at this location is 2000 cubic meters.

E81.3 Removal and Stockpile of Shoo-fly Sub- base and Sub -ballast Material

E81.3.1 As per City of Winnipeg Specification CW 3170 and E53.

E81.3.2 Approximate quantity of granular material required at this location is 2600 cubic meters.

E81.4 Both Suitable Site Material and Shoo-fly Sub-base/Sub-ballast Material shall be hauled and stockpiled in the property between the southeast access road and the East Side Storage Facility. No material shall be placed within the Imperial Oil Line easement without written approval from the Contract Administrator.

MEASUREMENT AND PAYMENT

E81.5 Items of Work in this Specification shall be measured and paid for as per City of Winnipeg CW 3173, E53 and E75.

E82. TEMPORARY PAVEMENT UNDER STRUCTURE

DESCRIPTION

E82.1 General

E82.1.1 This Specification supplements the latest version of the City of Winnipeg Standard Construction Specifications and covers the supply and installation of temporary pavement under the structure for the traffic staging in Stage C1 and C2 as shown in the Drawings.

E82.1.2 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.

E82.2 Referenced Standard Construction Specifications

E82.2.1 The latest version of the City of Winnipeg Standard Construction Specification CW 3310 – Portland Cement Concrete Pavement Works.

E82.2.2 The latest version of the City of Winnipeg Standard Construction Specification CW 3410 – Asphalt Concrete Pavement Works.

MATERIALS

E82.3 General

E82.3.1 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.

E82.4 The temporary pavement material to be placed in Stage C1 and C2 shall be a hard surface material made up of either concrete, asphalt, or an approved alternate. It shall be capable of maintaining traffic from the end of Stage 4 in Phase V to Stage 1 iii) in Phase VI as outlined in D23, providing safe driving conditions and without failure of the temporary pavement to the satisfaction of the Contract Administrator.

CONSTRUCTION METHODS

E82.5 This is a performance specification and therefore must the temporary pavements must be constructed in a way that they are capable of performing for the duration outlined above in a safe manner. Installation of the temporary pavement shall be to the grades provided by the Contract Administrator.

E82.6 There are two ways the Contractor may choose to construct the sub-base for the temporary structure:

E82.6.1 The Contractor may choose to construct the full sub-base structure for the permanent pavement and place the temporary pavement on top of the sub-base material as found in Section E on sheet CT-0050, or

E82.6.2 The Contractor may otherwise choose to not place the designed sub-base structure for the permanent pavement as described above and place a sub-base structure suitable for the temporary pavement to meet this performance specification.

E82.7 Quality Control

E82.7.1 The temporary pavement material will not be tested or be required to meet design standards but must withstand the loading of heavy traffic for the duration described above. During the use of this temporary pavement, if at any time, the Contract Administrator deems the material to have failed, is too rough for vehicular traffic, requires maintenance, or is deemed unsafe, the Contractor will be required to address these issues through whatever means necessary, be it through maintenance or complete replacement.

E82.8 Maintenance

E82.8.1 If the Contractor is required to address issues to the temporary pavement through maintenance, he shall do so in a way that will have the least amount of impact on traffic. This will result in performing maintenance on the temporary pavement after 23:30 and before 06:00.

E82.8.2 If the Contractor is required to address issues to the temporary pavement through a complete replacement, this shall be completed adjacent to the original temporary lanes, by installing new temporary lanes.

MEASUREMENT AND PAYMENT

E82.9 Supply And Installation Of Temporary Pavement Under The Structure

E82.9.1 The supply and installation of temporary pavement under the structure shall be measured on an area basis and paid for at the Contract Unit Price per square metre for “Temporary Pavement Under Structure” 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.

E82.9.2 Should the Contractor place the sub-base material structure as described in E82.6.1 above, payment for this material will be as per the material quantities within the Form B.

E82.9.3 Should the Contractor place a temporary sub-base material structure as described in E82.6.2 above, payment for this material will be incidental to the supply and installation of the temporary pavement under the structure.

E82.10 No additional payment will be made for any required maintenance or replacement of pavement or any work associated with these requirements, such as relocation of signage, temporary traffic barriers, etc. These costs shall be borne solely by the Contractor in order to maintain the performance of these pavements until Stage 1 iii) of Phase VI.

E82.11 The removal of temporary pavement shall be measured and paid for in accordance with CW 3110 – Pavement Removal within the Form B.

E83. PRECAST CONCRETE BARRIERS

DESCRIPTION

E83.1 General

E83.1.1 This Specification covers the transportation, placement and assembly of precast concrete barriers to the limit shown on the Construction Staging Drawings.

E83.1.2 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.

E83.2 Scope of Work

E83.2.1 The Work under this Specification shall involve:

(a) Transporting (including loading) temporary precast concrete traffic barriers from City of Winnipeg yard at 960 Thomas Ave. to the project site and installation on site;

(b) Relocating temporary precast concrete barriers on Site between construction phasing as shown on the Drawings;

(c) Removing from site and transporting (including unloading) temporary precast concrete traffic barriers to City of Winnipeg yard at 960 Thomas Ave.; and

(d) Maintaining the precast concrete traffic barriers in position on site throughout the project as part of the overall work and traffic management plans (no additional payment for maintenance).

MATERIALS

E83.3 General

E83.3.1 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.

E83.3.2 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.

E83.4 Precast Concrete Barriers

E83.4.1 The precast concrete barriers will be supplied by the City of Winnipeg Public Works Department and consist of a precast section approximately 850 mm high by 2740 mm long, two steel posts and a barricade style blade that mounts between the posts on top of the precast concrete section.

E83.5 Equipment

E83.6 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E83.7 Transporting Precast Concrete Barriers

E83.7.1 The Contractor shall be responsible for the pickup and delivery of the pre-cast concrete barriers and all applicable components to the site. The Contractor shall supply equipment capable of lifting and loading the barriers at the City yard and safely transporting to, and unloading the barriers at the site. Any damage occurring to the barriers during loading, transporting and unloading shall be repaired at the Contractor's expense.

E83.7.2 Prior to leaving the yard the Contractor's personnel shall inspect the barriers in conjunction with City personnel and note any obvious damage. The Contractor shall provide the

Contract Administrator with a written description of any damage noted prior to transportation of the barriers.

E83.7.3 The barriers are located at the

City of Winnipeg Public Works Bridge Yard

960 Thomas Ave.

Phone: (204) 794-8510

Contact: Mr. Mike Terleski C.E.T

E83.7.4 A minimum of twenty-four (24) hours' notice is required prior to pick up of the barriers. Once the barriers have reached the Site they shall be carefully unloaded, placed and assembled at the locations shown on the Drawings.

E83.8 Installation of Precast Concrete Barriers

E83.8.1 Precast concrete barriers shall be installed in proper vertical and horizontal alignment and properly connected to the satisfaction of the Contract Administration.

E83.8.2 Schedules for installing or removing the precast concrete barriers shall be approved by the Contract Administrator prior to any Work beginning on those items.

E83.8.3 Once the concrete section of each barrier has been placed, the Contractor shall assemble the metal pole and barricade sections of the barriers onto the concrete sections. Should there be any missing nuts bolts or washers, the Contractor shall supply new galvanized nuts, bolts and/or washers.

E83.8.4 Maintain and adjust temporary concrete barriers as required through the duration of the Project, the maintenance and adjustment to temporary precast concrete barriers shall be deemed incidental to the Work.

E83.9 Relocation of Precast Concrete Barriers

E83.9.1 The Contractor shall relocate precast concrete barriers between construction phasing as shown on the Drawings. Approximately 50% of the barriers shall be relocated within the site.

E83.10 Removal and Transportation of Precast Concrete Barriers

E83.10.1 The Contractor shall be responsible for the removal and delivery of the precast concrete barriers and all applicable components from Site. The Contractor shall return all barriers to the City Bridge Yard, as identified in E28.5.1(c). The Contractor shall supply all necessary equipment to unload and return the barriers to their designated locations within the City Bridge Yard. Any damage occurring to the barriers during loading, transporting, and unloading shall be repaired at the Contractor's expense. Any missing items or components originally supplied by the City shall be replaced at the Contractor's expense. Upon return of the barriers, the Contractor's personnel and City's personnel shall inspect and inventory the barriers and all applicable components.

E83.11 Quality Control

E83.11.1 Inspection

(a) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection 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 approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E83.11.2 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.

MEASUREMENT AND PAYMENT

E83.12 Transportation, Installation, Relocation and Removal of Temporary Precast Concrete Barriers

E83.12.1 Transporting, installing, relocating and removing precast concrete barriers will be measured on a Unit basis and paid for at the Contract Unit Price per each for "Temporary Precast Concrete Barriers", 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.

E83.12.2 No additional payment will be made for relocation of the Precast Concrete Barriers.

LANDSCAPING

E84. INSTALLATION OF INTERLOCKING PAVING STONES ON A LEAN CONCRETE BASE

DESCRIPTION

E84.1 This specification shall supplement and amend City of Winnipeg Standard Construction Specification CW 3335 "Installation of Interlocking Paving Stones on a Lean Concrete Base".

E84.1.1 Referenced Standard Construction Specifications: CW 3335- Installation of Interlocking Paving Stones on a Lean Concrete Base

E84.1.2 Referenced Standard Detail: SD-240B- Interlocking Paving Stones On Lean Concrete Base

E84.2 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.

MATERIALS

E84.3 General

E84.3.1 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.

E84.3.2 Interlocking Paving Stones

(a) Paving stones shall be Barkman Concrete "Navarro" or equal as accepted by the Contract Administrator in accordance with B8. The pattern in the traffic islands shall be Navarro Paver Pattern as found in Barkman's 'Paver Installation Guide'. The pattern for the Rest Area shall be Navarro Running Bond Pattern. All pavers to be "Sierra Grey" 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.

E84.3.3 Other Materials

(a) All other materials, including aggregates for the lean concrete mix, the lean concrete mix, bedding sand and filler sand shall be in accordance with CW 3335.

CONSTRUCTION METHODS

E84.4 General

E84.4.1 Installation of Paving Stones on a Lean Concrete Base

(a) Install paving stones on a lean concrete base in accordance with CW 3335 and SD-240B.

MEASUREMENT AND PAYMENT

E84.5 Supply and Installation of Interlocking Paving Stones

E84.5.1 Supply and installation of interlocking paving stones shall be measured and paid for in accordance with CW 3335.

E84.6 Supply and Installation of Lean Concrete Base

E84.6.1 Supply and installation of lean concrete base shall be measured and paid for in accordance with CW 3335.

E85. SITE FURNISHINGS

DESCRIPTION

E85.1 General

E85.1.1 This Specification covers all operations relating to the supply and installation of benches and waste receptacles along the active transportation pathway.

E85.1.2 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.

MATERIALS

E85.2 General

E85.2.1 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.

E85.3 Site Furniture shall be:

E85.3.1 Bench: Tache Style Composite Bench with Arm Rests, as per SCD-121A, Product #52501085, or substitute approved in accordance with Substitution procedures.

E85.3.2 Trash Receptacle: Metal Slat Type, as per SCD-119, Product #52501063BLK with Wire Basket, Product #52501058, or substitute approved in accordance with Substitution procedures.

(a) Contact for Bench and Trash Receptacle:

Aaron Lennon, 204-986-5505
Supervisor of Central Repair/Manufacturing Facility
City of Winnipeg
Fleet Management Agency Division
Public Works Department
215 Tecumseh St.
Winnipeg, MB R3E 3S4

Email: ALennon@winnipeg.ca

CONSTRUCTION METHODS

E85.4 Benches and Trash Receptacles

E85.4.1 Install benches and trash receptacles with in-ground mountings as indicated on the Construction Drawings.

MEASUREMENT AND PAYMENT

E85.5 Benches and Trash Receptacles

E85.5.1 Benches and trash receptacles will be measured on a unit basis and paid for at the Contract Unit Prices per each for "Bench" and "Waste Receptacle", 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.

E86. TOPSOIL, SOIL AMENDMENTS, GROWING MEDIUM AND FINISH GRADING

DESCRIPTION

E86.1 General

E86.1.1 This Specification shall amend and supplement City of Winnipeg Standard Specification CW 3540 "Topsoil and Finish Grading for Establishment of Turf Areas" and covers all operations relating to the supply, preparation and placement of topsoil and growing medium, including preparation of existing grade, finish grading and fertilizer application for restoration seeding.

E86.1.2 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.

E86.2 Quality Control

E86.2.1 Testing and Samples:

(a) Submit to the Contract Administrator analyses of soil base to be used in creating growing medium, obtained for at least three separate samples taken from each area of the site. The analysis shall be carried out by a qualified soil testing laboratory and shall include the percentage of organic material by weight, as well as recommendations for fertilizers and/or other soil ameliorants.

(b) Soil testing shall determine N, P, K, Na, Cl, Ca, Mg, organic matter, C.E.C., pH, bulk density and C/N ratio.

E86.2.2 Deliver and store fertilizer in waterproof bags showing weight, analysis and name of manufacturer.

MATERIALS

E86.3 General

E86.3.1 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.

E86.3.2 Imported topsoil and fertilizer shall conform to CW 3540.

E86.3.3 Peatmoss shall be derived from partially decomposed species of Sphagnum Mosses, elastic and homogenous, brown in colour; free of decomposed colloidal residue, wood, sulphur and iron or other deleterious material which could affect healthy plant growth;

containing a minimum 60% organic matter by weight, and moisture content not exceeding 15%. Shredded particles may not exceed 5 mm in size. Minimum pH value of peat, 4.5; maximum, 7.0.

E86.3.4 Sand shall be medium to coarse textured silica sand to CSA A82.56-M1976, well washed and free of impurities, chemical or organic matter.

E86.3.5 Bonemeal shall be raw bonemeal, finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid.

E86.3.6 Fertilizer: chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil testing laboratory approved by the Contract Administrator, provided for each of the following:

(a) Sod with imported topsoil

(b) Horticultural trees and shrubs with growing medium

(c) Naturalized low mow seeding with soil amendments

(d) Salt tolerant seeding with soil amendments

(e) Turf grass seeding with soil amendments

E86.3.7 Chemical Herbicide Application: Roundup or similar chemical herbicide approved by Agriculture Canada. Use only with the approval of the Contract Administrator.

E86.3.8 Wood Chip Mulch:

(a) Wood chip mulch shall be chipped ash, maple, poplar, birch and other deciduous trees. Mulch shall be chipped to sizes ranging from 50mm to 100mm. Mulch may contain stringy twigs and seed, free of non-organic material, wood preservatives or diseased wood. The mulch shall contain no more than 5% of the following materials in total: soil, sawdust, peatmoss, coniferous wood and needles.

(b) The Contractor shall supply a wood chip mulch sample to the Contract Administrator for approval prior to installation.

CONSTRUCTION METHODS

E86.4 Preparation of Existing Grade:

E86.4.1 Rough grading in all areas will be performed by others. Rough grading shall be within 50 mm of the mud grade required prior to addition of peatmoss and sand to create the growing medium.

E86.4.2 Preparation of the existing grade shall conform to CW 3540.

E86.5 Imported Topsoil:

E86.5.1 Installation of imported topsoil in areas to receive sod, including placing topsoil, applying fertilizer and finish grading shall conform to CW 3540-R5.

E86.5.2 Install imported topsoil to 75 mm compacted depth in areas to be sodded >600 mm and in areas to be sodded < or = 600 mm strips in non seeded areas.

E86.6 Soil Amendment for Salt Tolerant Seed Mix, Naturalized Low Mow Seed Mix, Turf Grass Seed Mix and related sod edge strips.

E86.6.1 Soil amendment for Salt Tolerant Seed Mix, Naturalized Low Mow Seed Mix, Turf Grass Seed Mix and related sod edge strips shall consist of a mix of 60% peat moss and 40% sand, loose by volume.

E86.6.2 Cross-cultivate the entire area of soil base that is to receive soil amendments to a depth of 150 mm. Redo areas where equipment used for hauling and spreading has re-compacted sub-grade

E86.6.3 Spread 30 mm of peat moss and 20 mm sand over the area of soil amendments.

E86.6.4 Roto-till or disc the peat moss and sand into the top 100 to 125 mm of base material and mechanically roll to obtain a level surface.

E86.6.5 Grade to eliminate rough spots and low spots and to maintain positive drainage.

E86.6.6 Consolidate seedbed to required bulk density using equipment approved by the Contract Administrator. Leave surfaces smooth, uniform and firm against deep foot-printing.

E86.7 Growing Medium for Planting Trees and Shrubs in Planting Beds:

E86.7.1 For planting trees and shrubs,

(a) 65% topsoil with 25% sand loose by volume and 10% organic matter (peat, rotted manure or composted material) loose by volume.

(b) Incorporate bonemeal into planting soil at rate of 3 kg/m3 of planting bed area.

E86.8 Construction of Planting Beds

E86.8.1 Final planting bed locations shall be laid out by the Contractor and reviewed with the Contract Administrator in the field prior to installation of trees and shrubs

E86.8.2 Excavate planting beds to a depth of 450 mm.

E86.8.3 Create planting bed growing medium, loosely compacted, 450 mm deep in planting beds with a smooth top surface to match surrounding contours. Level planting bed growing medium by hand around existing and newly planted trees and shrubs.

E86.9 Fertilizer:

E86.9.1 Fertilize trees and shrubs using slow-release organic fertilizers (nitrates and phosphates).

E86.9.2 Apply fertilizer at rates determined by the sub-soil analysis.

E86.10 Wood Chip Mulch: supply and install 50 mm deep deciduous wood chip mulch within all planting beds as shown on the Construction Drawings and in all planting clusters in areas designated Shrubs. Wood chip mulch to be pulled away from stems of all plant material.

MEASUREMENT AND PAYMENT

E86.11 Preparation of Existing Grade

E86.11.1 Preparation of the existing grade shall be incidental to the construction of seed bed and planting beds. No measurement and payment will be made for this Item of Work.

E86.12 Imported Topsoil and Fine Grading

E86.12.1 Imported topsoil and finish grading for sod will be considered incidental to the Works of this Specification. No measurement and payment will be made for this Item of Work.

E86.13 Soil Amendments for Salt Tolerant Seed Mix, Naturalized Low Mow Seed Mix and Turf Grass Seed

E86.13.1 Soil amendment for Salt Tolerant Seeding, Turf Grass Seeding, Naturalized Low Mow Seeding Mix and Related Sod Edge Strips shall be measured on an area basis and paid for at the Contract Unit Price per square metres of soil base incorporating peat moss and sand for “Soil Amendments for Salt Tolerant, Naturalized and Turf Grass Seeding and Related Sod Edge Strips”, 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.

E86.14 Construction of Planting Beds Growing Medium

E86.14.1 Construction of planting beds with growing medium shall be measured on an area basis and paid for at the Contract Unit Price per square metre of 450 mm depth planting bed constructed complete with 450mm depth planting soil mixture (depth is allowing for

settlement), for “Planting Beds with Growing Medium (450mm 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, accepted and measured by the Contract Administrator.

E86.14.2 There will be no separate measurement for planting soil mixture used in planting individual trees and shrubs that are not planted in beds.

E86.15 Supply and application of fertilizers will be incidental to the construction of seed bed and planting beds growing medium.

E86.16 Wood Chip Mulch:

E86.16.1 Supply and installation of wood chip mulch shall be made on an area basis and paid for at the Contract Unit Price per square metre placed at the specified depth for "Wood Chip Mulch (50mm depth)”, which payment shall be considered compensation in full for the supply of all materials and the performing of all operations necessary to complete the Work as specified including any items incidental to the Work of this specification..

E87. SODDING

DESCRIPTION

E87.1 General

E87.1.1 This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3510-R9 “Sodding”, and covers all operations relating sod supply and installation, including preparation of finish grade, watering and rolling, and 30-day maintenance.

E87.1.2 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.

E87.1.3 Referenced Standard Construction Specifications

(a) CW 3510-R9 Sodding

(b) CW 3540-R5 Topsoil and Finish Grading

E87.1.4 Referenced Standard Details

(a) SD-243- Sodding Details

MATERIALS

E87.2 General

E87.2.1 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.

E87.3 Turf Grass Sod

E87.3.1 Turf grass sod shall conform to CW 3510-R9.

E87.3.2 Sod shall be a mixture of 95% Kentucky bluegrass, using equal proportions of any three Class 2 cultivars, and 5% Creeping Red fescue.

E87.3.3 Topsoil and fine grading shall conform to CW 3540-R5 (see E86-Topsoil, Soil Amendments and Finish Grading).

CONSTRUCTION METHODS

E87.4 Installation of Topsoil and Finish Grading, Preparation of Finish Grade, Placement of Sod, Watering and Rolling and 30-Day Maintenance

E87.4.1 Install 75 mm topsoil in accordance with Topsoil, Soil Amendments, Growing Medium and Finish Grading Specification.

E87.4.2 Finish grading, sod placement, watering and rolling and 30-day maintenance shall conform to CW 3510-R9 and SD-243.

E87.4.3 Install one width of sod, 600 mm, along all sidewalk and active transportation pavements (outside sodded areas) following completion of soil amendments, and prior to seeding. (No topsoil)

MEASUREMENT AND PAYMENT

E87.5 Turf Grass Sod

E87.5.1 Turf Grass Sod will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Items of Work”, 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.

(a) Items of Work
   i) Sodding width greater than 600 mm (c/w 75 mm imported topsoil)
   ii) Sodding width less than or equal to 600 mm (c/w 75 mm imported topsoil)
   iii) Sodding width less than or equal to 600 mm (no topsoil)

(b) Payment for supply and installation of sod, including 30-day maintenance before acceptance will be in accordance with CW 3510-R9.

(c) Payment shall be in accordance with the following:
   i) 75% of quantity following supply and placement of sod including topsoil depth as specified in Form B.
   ii) 25% of quantity following termination of the 30 day maintenance period before acceptance.

E88. SEEDING

DESCRIPTION

E88.1 General

E88.1.1 This specification shall amend and supplement CW 3520 "Seeding", and covers all operations relating to the supply and installation of seed, including preparation of finish grade, hydro mulching, and maintenance.

E88.1.2 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.

E88.1.3 Provide the Contract Administrator with Certificates of Analysis and mix compositions for all seed mixes at least three (3) working days prior to commencing the Work. Include supplier’s name and telephone contact information, and percentages of each species and cultivar in each mix.

E88.1.4 The Contractor must obtain the Contract Administrator’s approval for any proposed adjustments to the seed mix species or cultivars.

MATERIALS

E88.2 General

E88.2.1 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.

E88.3 All seed supplied by the Contractor shall be Canada Certified No. 1 or Canada Certified No. 2 and come complete with a Certificate of Analysis verifying that quality standards for Canada Certified No. 1 or Canada Certified No. 2 seed are met.

E88.4 Naturalized Low Mow Seed Mix

E88.4.1 Seed for naturalization area to be local native tall grass prairie seed with specific mixes for each slope, aspect and elevation. Contractor to supply a seed mix list prior to installation. Seed mix to include no greater than 34% of any one species and a minimum of 3 species from:

Big Bluestem	June Grass	Green Needlegrass
Fringed Brome	Switch Grass	Slender Wheatgrass
Canada Wild Rye	Tickle Grass	Western Wheatgrass

E88.5 Salt Tolerant Seed Mix:

70% Fults Alkaligrass *(Puccinellia distans)*

20% Audubon or Aberdeen Red fescue *(Festuca rubra*)

10% Perennial Rye Grass *(Lolium perenne)*

E88.6 Turf Grass Seed Mix

E88.6.1 Turf grass seed mix shall conform to CW 3520 and shall be a mixture of the following species:

60% Kentucky bluegrass (*Poa pratensis*), including equal proportions of any three Class 1 or 2 cultivars;

30% Creeping Red fescue (*Festuca rubra*), and

10% Perennial ryegrass (*Lolium perrenne*), using any of the recommended cultivars.

E88.7 Fescue Over-seed Mix

E88.7.1 The Fescue Over-seed mix shall be a blend of 50% of Creeping Red fescue or Audubon or Aberdeen Red fescue and 50% Fults Alkaligrass:

E88.8 Cover Crop

E88.8.1 Use Annual ryegrass as a cover crop (nurse crop) in all areas to be seeded.

E88.9 Soil amendments, topsoil and finish grading shall be in accordance with CW 3540-R5 and as per Topsoil, Planting Soil, Soil Amendments, Growing Medium and Finish Grading Specification.

E88.10 Hydro-mulch: mulch, water and tackifier shall be in accordance with CW 3520.

E88.11 Herbicides and insecticides shall be in accordance with CW3520 and Chemical Control of Vegetation Specification.

CONSTRUCTION METHODS

E88.12 Salt Tolerant Seed Mix Soil Amendments; Seeding, Hydro Mulching, and Maintenance

E88.12.1 Seed with a Brillion Seeder, or equal as accepted by the Contract Administrator in accordance with B8, on 100 mm compacted depth of imported topsoil placed over scarified or pulverized sub-grade to a minimum depth of 50 mm except in areas within the edge of a tree canopy (or drip line) and conditioned in accordance with the Topsoil, Planting Soil, Soil Amendments and Finish Grading Specification in Salt Tolerant Seed areas. Preparation of seed bed as per CW 3520-R7.

E88.12.2 Seeding and hydro mulching, and maintenance of areas designated as “Salt Tolerant Mix” shall conform to CW 3520-R7:

(a) Sow Salt Tolerant Seed Mix at 2.2 kg/100 square metres (220 kg/hectare),

(b) Sow cover crop at 0.6 kg/100 square metres.

E88.13 Naturalized Low Mow Seed Mix: Soil Amendments, Seeding, Hydro Mulching, and Maintenance

E88.13.1 Seed with a Brillion Seeder, or equal as accepted by the Contract Administrator in accordance with B8, on amended soil base, conditioned in accordance with “Topsoil, Planting Soil, Soil Amendments and Finish Grading Specification” in Naturalized Low Mow Seed Mix areas.

E88.13.2 Seeding and hydro mulching, and maintenance of areas designated as “Naturalized Low Mow Seed Mix” shall conform to CW3520-R7.

(a) Naturalized Low Mow seed mix at 1.2 kg/100 square metres (120 kg/hectare),

(b) Sow cover crop at 0.6 kg/100 square metres.

E88.14 Turf Grass Seed Mix: Soil Amendments, Seeding, Hydro Mulching, and Maintenance

E88.14.1 Soil amendments shall be as per Topsoil, Soil Amendments, Growing Medium and Finish Grading Specification.

E88.14.2 Seeding and hydro mulching and maintenance shall be in accordance with CW 3520.

E88.15 Fescue Over-seed Mix

E88.15.1 Over-seed fescue mix in sod areas > 600mm in width, 90 days after sod installation, or as instructed by the Contract Administrator, using a slit seeder or drill seeder.

E88.15.2 Over-seed at a rate of 0.75 kg/100 square metres (75kg/hectare)

E88.16 Maintenance of Areas Seeded with Salt-tolerant Seed Mix, Turf Grass Seed Mix and Naturalized Low Mow Seed Mix

E88.16.1 The Contractor shall water seeded and hydro mulched areas as required to obtain optimum soil moisture levels for germination and continued growth of grasses. Control the watering to prevent seed washouts.

E88.16.2 The Contractor shall mow salt tolerant seed mix areas when grasses exceed 175 mm in height, mow to 125 mm height.

E88.16.3 The Contractor shall mow naturalized low mow seed mix areas once annually, in October, removing cut material that would smother grasses.

E88.16.4 Additional mowing, at a height of 100 mm, shall be completed upon the direction of the Contract Administrator, as required to remove extensive weed growth and/or to maintain healthy growth of grasses.

E88.16.5 Fertilizer:

(a) Where soil analysis and recommendation for fertilizer is unavailable apply 11-52-0 at a rate of 0.75 kg per 100 square metres.

E88.16.6 Maintenance for Establishment

(a) Maintenance for establishment and acceptance conditions for Salt Tolerant and Turf Grass seeded areas shall be in accordance with CW 3520.

(b) Maintain naturalized low mow seed mix areas for growth establishment for a period of ninety days following completion of seeding and hydro-mulching operations.

(c) The contractor shall water seeded and hydro-mulched areas as required to obtain optimum soil moisture levels for germination and continued growth of grasses. Control the watering to prevent seed washouts.

(d) The contractor shall mow naturalized low mow seed mix areas once, preferably in October, removing cut material that would smother seeded plants.

(e) Additional mowing to a height of 125 mm shall be completed as directed by the contract administrator in order to remove extensive weed growth and/or to maintain healthy growth of grasses.

E88.16.7 Chemical Weed Control: the contractor shall use chemical weed control, Roundup, 2-4 D or Diacamba, only as required to spot remove weeds in localized areas

E88.16.8 The maintenance period will terminate after the following criteria have been met:

(a) Certified seed that has been sowed meets the requirements of CW 3520 and this specification

(b) Seeded grasses show healthy, vigorous growth

(c) The seeded area has a firm, uniform and even surface

(d) The seeded area is free of debris, including leaves

(e) The seeded area has sufficient growth density that bare spots do not exceed 5% of total surface area

(f) The area has less than 10 noxious weeds per 50 square metres

(g) Seeded areas are free of damaging insects

MEASUREMENT AND PAYMENT

E88.17 Seeded Areas

E88.17.1 Seeded areas will be measured on an area basis for each type of seed mix type 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, CW3510-R9, and accepted and measured by the Contract Administrator.

(a) Items of Work

i) Seeding

- Naturalized Low Mow Seed Mix
- Salt Tolerant Seed Mix
- Turf Grass Seed Mix
- Fescue Over-seed Mix

E88.18 Nurse or Cover Crop Seeding

E88.18.1 Nurse or Cover Crop Seeding: there will be no separate measurement for nurse or cover crop seeding. Seeding of a nurse crop will be incidental to other seeding operations.

E88.19 Herbicides and Insecticides

E88.19.1 Herbicides and Insecticides: there will be no separate measurement for materials, equipment and operations related to the use of herbicides and insecticides.

E89. TREES, SHRUBS AND GROUND COVERS

DESCRIPTION

E89.1 General

E89.1.1 This specification covers all operations relating to the supply and installation of nursery-grown trees, shrubs and groundcover plantings in areas indicated on the Drawings, including preparation, digging, transport and planting, and maintenance.

E89.1.2 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.

E89.2 Nomenclature

E89.2.1 Nomenclature of specified nursery stock shall conform to the International Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.

E89.3 Source Quality Control

E89.3.1 All nursery stock supplied shall be nursery grown and of species and sizes as indicated on the Drawings. Nursery stock shall be No. 1 Grade material in accordance with the current edition of Landscape Canada's (CNTA) "Guide Specifications for Nursery Stock".

E89.3.2 Any nursery stock dug from native stands, wood lots, orchards, or neglected nurseries, which have not received proper cultural maintenance, shall be designated as "collected plants". The use of "collected plants" will not be permitted unless approved by the Contract Administrator.

E89.3.3 The Contractor shall notify Contract Administrator of source of plant material at least seven (7) days in advance of shipment.

E89.3.4 Acceptance of plant material at source does not prevent rejection of same plant material on site prior to or after planting operations.

E89.3.5 Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

E89.4 Shipment and Pre-Planting Care

E89.4.1 Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.

E89.4.2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root balls, especially of large trees, during lifting.

E89.4.3 Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peat, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

E89.4.4 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 50 mm diameter with wound dressing.

E89.4.5 Keep roots moist and protect from sun and wind. Heel-in trees and shrubs that cannot be planted immediately in shaded areas; water well.

E89.5 Replacement

E89.5.1 During the first two (2) years following completion of planting operations, remove from site any plants that have died or failed to grow satisfactorily, as determined by the Contract Administrator. As an example, plant material installed in 2014 that has failed to grow satisfactorily and has not been replaced by October 31, 2015, would be required to be replaced in the spring of 2016.

MATERIALS

E89.6 General

E89.6.1 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.

E89.7 Water

E89.7.1 Water shall be potable and free of minerals that may be detrimental to plant growth.

E89.8 Fertilizer

E89.8.1 Fertilizer shall be slow release organic. Fertilizer shall contain N-P-K in ratio as recommended by soil test results from an approved agricultural soil testing laboratory.

E89.9 Trunk Protection and Tree Support

E89.9.1 Tree protection shall be a 100mm x 600mm long section of plastic weeping tile material.

E89.9.2 Tree support stakes shall be T-rail iron stakes 40 x 40 x 5 x 1540 mm long, primed with 1 brush coat of zinc rich plant paint to CGSN 1-GP-191B. Stakes shall be uniform in style and colour.

(a) Other products may be used with prior permission in writing from the Contract Administrator.

E89.9.3 The guying straps shall be of a material that is non-abrasive to the tree to prevent girdling injury:

(a) Hose-covered wire, flexible belting or any strong, soft wide strips of material is acceptable.

E89.10 Root Ball Burlap

E89.10.1 Root ball burlap shall be 150 g Hessian burlap.

E89.11 Anti-desiccant

E89.11.1 Anti-desiccant shall be wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

E89.12 Wound Dressing

E89.12.1 Wound dressing shall be horticultural accepted non-toxic, non-hardening emulsion.

E89.13 Plant Material

E89.13.1 All plant material specified for this project shall be containerized and/or ball and burlap nursery stock. All plants shall be from the Winnipeg area and the Oak-Aspen Forest Eco-region.

E89.13.2 Comply with latest edition of the “Guide Specification for Nursery Stock”, produced by Landscape Canada (CNTA), referring to quality, size and development of nursery-grown plant material and root balls.

E89.13.3 Nursery stock shall be No. 1 grade trees, shrubs and vines.

E89.13.4 All plant material shall be measured when branches are in their natural position. Height and spread dimensions specified in the Plant List on the Drawings refer to the main body of the plant, and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by calliper (cal.), reference is made to the diameter of the trunk measured at 300 mm above ground as the tree stands properly planted in the nursery.

E89.13.5 All containerized whips and herbaceous plant material shall have a minimum of one full year's growth. Roots shall be healthy, reaching the sides of the containers, and developed such that the root ball can be kept intact during transplanting. Roots shall not encircle each other to the extent of inhibiting plant growth.

E89.13.6 Any plants designated as nursery stock but dug from native stands, wood lots, orchards, or neglected nurseries that have not received proper cultural maintenance, shall be designated as “collected stock”. Material sources are to be approved by Contract Administrator prior to ordering or collecting. The Contractor shall provide all of the necessary nursery certificates to ensure that the plant species comply with this specification.

E89.13.7 All trees shall have one, only, sturdy, reasonably straight and vertical trunk, and a well-balanced crown with fully developed leader, unless designated “multi-stem”. All evergreens shall be symmetrically grown and branched from ground level, up.

E89.13.8 Use trees, shrubs and groundcovers with structurally sound, strong fibrous root systems, and free of disease, insects, defects or injuries, including rodent damage, sun scald, frost cracks, abrasions or scars to the bark. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site.

E89.13.9 All parts of the plants shall be moist and show live, green cambium tissue when cut.

E89.13.10 At least one (1) plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant.

E89.14 Additional Plant Material Qualifications:

E89.14.1 Imported Plant Material

(a) Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in in a protected area or placed in cold storage until conditions suitable for planting. Obtain Contract Administrator’s approval to use imported plant material.

E89.14.2 Cold Storage

(a) Approval required for plant material that has been held in cold storage.

E89.14.3 Container-Grown Stock

(a) Acceptable if containers large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season but not longer than two. Root system must be able to hold soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

E89.14.4 Balled and Burlapped Plant Material

(a) Deciduous trees in excess of 3 m height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 10 mm diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.

E89.14.5 Tree Spade Dug Material

(a) Obtain approval of the Contract Administrator for digging plant material with mechanized digging equipment, hydraulic spade or clam-shell type. This type of digging is typically not acceptable for boulevard tree plantings. Dig root balls to satisfy Landscape Canada (CNTA) standards. Lift root ball from hole, place in wire basket designed for purpose, line with burlap. Tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket ties or rope.

E89.14.6 Substitutions

(a) Substitutions to plant material as indicated on the Plant List will not be permitted unless written approval has been obtained as to type, variety and size prior to award of Contract. Plant substitutions must be of similar species and of equal size to those originally specified.

CONSTRUCTION METHODS

E89.15 General

E89.15.1 Workmanship

(a) The Contractor shall stake out location of trees, shrubs and planting beds as per the Drawings. Obtain Contract Administrator's approval prior to excavating.

(b) The Contractor shall obtain clearances from all utilities, with respect to underground lines located in the areas to be excavated, prior to commencing planting operations.

(c) The Contractor shall apply anti-desiccant in accordance with material manufacturer's instructions.

(d) The Contractor shall coordinate planting operations; keep the site clean and planting holes drained, and immediately remove soil or debris spilled onto pavement.

E89.15.2 Planting Time

(a) The Contractor shall plant deciduous plant material during dormant period before buds have broken. Plant material noted for spring planting only must be planted in dormant stage.

(b) Plant material imported from region with warmer climatic conditions may only be planted in early spring.

(c) When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.

(d) When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout growing season.

(e) Plant only under conditions that are conducive to health and physical conditions of plants.

(f) The Contractor shall provide the Contract Administrator with a planting schedule at least two weeks prior to planting operations. Extending planting operations over long period using limited crew will not be accepted.

E89.15.3 Excavations

(a) Shrub beds: excavate to minimum depth of 450 mm, as indicated on the Drawings. Individual shrubs shall be planted in 500 mm deep holes backfilled with planting soil mixture.

(b) Trees: excavate to depth such that the top of the root ball is even with existing grade, with a surface width of two times the diameter of the root ball. Backfill around trees with planting soil mixture.

(c) The sides of all tree pits shall be scarified to the depth of one shovel blade.

(d) Provide drainage for planting holes in heavy soil if natural drainage does not exist. Have method approved.

(e) Protect the bottoms of excavations against freezing.

(f) Remove water that enters excavations prior to planting. Ensure source of water is not ground water.

E89.15.4 Planting

(a) Trees shall be placed on undisturbed soil and to a depth equal to that at which they were originally growing at the nursery.

(b) For shrubs, loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum of 150 mm of planting soil mixture.

(c) Plant trees, shrubs and groundcover vertically, with roots placed straight out in hole. Orient plant material to give best appearance in relation to structures, roads and walkways.

(d) Place plant material to depth equal to depth they were originally growing in nursery or in locations collected.

(e) Ball and burlap root balls: loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non-biodegradable wrappings must be removed.

(f) Tamp planting soil mixture around root system in layers of 150 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil has been placed, fill hole with water. After water has been completely penetrated into soil, complete backfilling.

(g) Excavate 200 mm depth an additional 600 mm beyond planting pits around the perimeter of all tree planting pits, and fill with planting soil mixture.

(h) Construct 75 mm deep saucers around the outer edge of planting pits to assist with maintenance watering.

(i) When planting is completed apply slow release organic fertilizer at minimum rate of 12 kg/100 m for shrub beds or 50 g/mm of calliper for trees, or as recommended by the soil analysis. Mix fertilizer thoroughly with top layer of planting soil and water in well.

E89.15.5 Tree spade excavated materials:

(a) Tree spade planting shall be permitted only by approval of the Contract Administrator.

(b) Dig tree pit with same mechanical equipment as used to dig plant material. Ensure hole dug is upright as possible. Place in hole a mixture of 40 L of planting soil and fertilizer mixed with water to soupy consistency. This will be forced up sides of ball as root ball is placed in hole.

(c) Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum 150 mm topsoil mixture.

E89.15.6 Pruning

(a) Prune trees, shrubs and groundcover after planting, as indicated. Postpone pruning of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches. Remove dead and injured branches and branches that rub causing damage to bark. Trim trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches.

E89.15.7 Standards

(a) All roots shall be cleanly cut; split roots are not acceptable.

(b) Branches and trunks shall be tied and protected; broken or abraded branches or trunks are not acceptable.

(c) Planting shall be protected from drying conditions; desiccated material not acceptable.

(d) All plants shall be free of insects and disease: galls, blight and other manifestations of insect infestation or disease not acceptable.

E89.15.8 Trunk Protection and Tree Support

(a) Slice open the plastic weeping tile material and place it around the base of each tree trunk

(b) Place tree supports as indicated on Landscape Detail Drawings.

(c) The guying straps shall be attached in accordance with the Landscape Detail Drawings. Where wire is used, ensure ends are twisted tight, protruding ends are unacceptable.

E89.15.9 Wood Chip Mulch

(a) All planting beds shall be covered with a 50 mm depth of wood chip mulch to the limits shown on the planting details.

(b) Wood chip mulch shall extend under all tree limbs, but shall not be installed within 150 mm of the tree trunk.

(c) The saucers of all trees not planted in beds shall be covered with a 75 mm depth of wood chip mulch.

E89.16 Maintenance

E89.16.1 Watering

(a) Plant material shall be watered once a week for first four weeks following installation, and once every second week, thereafter. Ensure adequate moisture in root zone at freeze-up.

E89.16.2 Weeding

(a) Keep mulched shrub beds and tree saucers weed-free by manually removing weeds during the maintenance period.

E89.16.3 Insects and Diseases

(a) Spray plants to combat pests and diseases. Use organic chemical insecticides approved by Agriculture Canada.

E89.16.4 Adjustments

(a) Make adjustments requested by the Contract Administrator, including straightening trees, tightening guy wires and removing tree stakes.

E89.16.5 Maintenance Period

(a) Maintain plant material for a period of two years following acceptance to start maintenance period of planting operations, as determined by the Contract Administrator.

MEASUREMENT AND PAYMENT

E89.17 Trees, Shrubs and Groundcovers

E89.17.1 Supply and installation of trees, shrubs and groundcovers will be measured on a unit price basis for each tree, shrub and groundcovers listed in the “Plant List”, 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.

E89.18 Fertilizer

E89.18.1 Supply and installation of fertilizer for plant material will be considered incidental to the Works of this Specification. No measurement and payment will be made for this Item of Work.

E90. LONG TERM SCHEDULED MAINTENANCE OF PLANT MATERIAL AND PLANTING BEDS

DESCRIPTION

E90.1 This specification covers all operations relating to the maintenance of plant material and planting beds following acceptance of the Work by the Contract Administrator.

E90.1.1 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.

E90.2 MATERIALS

E90.3 General

E90.3.1 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.

E90.4 The Contractor shall provide all necessary materials and equipment including: additional topsoil, soil ameliorates, mulches, fertilizers and pesticides, and pruning tools, water trucks, hoses, water metres and any other items necessary for the maintenance of the areas indicated in this specification.

CONSTRUCTION METHODS

E90.5 Provision of Maintenance Personnel

E90.5.1 The Contractor shall provide all necessary personnel for the ongoing maintenance operations.

E90.6 Capability of Personnel

E90.6.1 Maintenance personnel should have at least one year of experience in arboriculture/maintenance and should be under the direction of a foreman, in all cases, with not less than five years of experience with similar maintenance operations.

E90.6.2 The maintenance foreman shall be familiar with plant identification.

E90.7 Maintenance Period

E90.7.1 Maintain plantings for a period of two (2) years from the completion of the Maintenance for Establishment period, as determined by the Contract Administrator. Note: Completion shall not occur after October 30, or before May 15 of any year.

E90.8 Maintenance Schedule

E90.8.1 Provide the Contract Administrator a Schedule of Proposed Maintenance Activities for the two-year scheduled maintenance period, based on the requirements outlined herein. The scheduled maintenance period shall not commence until the schedule has been reviewed by the Contract Administrator.

E90.9 Recording Maintenance Operations

E90.9.1 The Contractor shall provide a detailed maintenance log, including but not limited to the following: hours of labour undertaken, number of personnel employed and equipment used. The log will itemize watering, spraying and any other maintenance work. Contractor shall submit logs monthly at regularly scheduled meetings with the Contract Administrator. Maintenance log will be included in payment for the maintenance work

E90.10 Traffic

E90.10.1 Do not conduct maintenance operations during peak traffic periods (Monday to Friday from 07:00 to 09:00 and from 15:30 to 17:30).

E90.11 Maintenance of Trees, Shrubs, and Planting Beds

E90.11.1 Maintain trees, shrubs, vines and planting beds as indicated in Trees, Shrubs and Ground Covers Specification - maintenance clause.

E90.11.2 Watering Trees, and Shrubs

(a) Newly planted trees, and shrubs require water to become established; however, watering too often can kill a plant. During the summer, if temperatures are fairly high and there has been no rainfall, water approximately once a week.

(b) Contractor shall determine the need for watering by taking soil tests weekly with a one-inch auger. Take a test sample from both the planting soil and from the tree root

balls by drilling to a minimum depth of 600 mm. The soil shall contain enough moisture to hold together when compressed in the hand, but shall not be muddy.

(c) Testing shall be undertaken at a minimum of 10 sites per week at a minimum of 10m between sites. The installed plant material and bioengineering shall not be allowed to dry out to the detriment of the viability of the plant material. Contractor shall monitor and submit lots to the Contract Administrator monthly. Contractor shall water-in plant material works in late fall during the scheduled maintenance period.

(d) Thoroughly soak coniferous trees prior to winter freeze-up.

E90.11.3 Fertilizing, Pruning and Spraying Deciduous Trees and Shrubs

(a) Because of the specialized nature of such operations, employ a qualified local arborist.

E90.11.4 Pruning Deciduous Trees and Shrubs

(a) Prune in accordance with Trees, Shrubs and Ground Covers Specification - pruning clause by thinning out unnecessary limbs or portions of limbs and by cutting back the terminal growth. Cut with pruning shears and with handsaws for limb-wood. When cutting the terminal growth, make the cuts one-quarter inch above the bud or lead twig. Where an entire limb is removed, make the cuts flush with the main stem or trunk.

E90.11.5 Cultivation

(a) Cultivate only as required to reconstruct planting beds or tree saucers, or to remove significant weed growth.

(b) Do not cultivate around plants with a shovel or spade. The tendency is to penetrate too deeply and cause root injury. Cultivate with a hoe or similar tool. When using a hoe never penetrate soil more than 50 mm. Maintain natural elevation of the surrounding area when cultivating. Create a gentle saucer to contain water around the tree root zone.

(c) Avoid pyramiding soil around the base of any plant as this causes water to drain away and will encourage undesirable top root growth.

(d) The boundary between the adjacent sod and soil saucer should be crisp and well formed.

(e) Restore wood chip mulch when cultivation completed.

E90.11.6 Spraying

(a) Spray trees and shrubs to control insect pests and diseases. Use horticultural compounds approved by Agriculture Canada, which are specific for the problem to be contained.

E90.11.7 Straightening

(a) Straighten trees as required or as directed by the Contract Administrator

E90.11.8 Mulching Wood Chip

(a) Add wood chip mulch to planting areas as required to maintain an even fresh surface.

E90.11.9 Weeding

(a) Hand weed and lightly rake a minimum of once per month, or as determined by the Contract Administrator, to remove competition for installed plant material/undesirable plant material. Dispose of undesirable material off-site.

(b) The Contractor shall be responsible for any fines or weed control notices issued for the planting areas. All such notices shall be dealt with by the Contractor in a timely fashion. Copies of any fines and notices shall be provided to the Contract Administrator within five (5) working days of receipt by the Contractor.

E90.11.10 Dispose of waste material at a recognized solid waste disposal site.

MEASUREMENT AND PAYMENT

E90.12 General Maintenance of Trees, Shrubs and Planting Beds

E90.12.1 Trees, Shrubs and Planting Beds will be measured on a unit and paid for at the Contract Unit Price per annual 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, accepted and measured by the Contract Administrator.

(a) Items of Work

i) General Maintenance of Landscaping

ii) General Plant Material and Planting Bed Maintenance

(b) Two year general maintenance of trees and shrubs, and planting beds including fertilizing, pruning, spraying for insects, disease control, cultivation, care of guy wires and turnbuckles, straightening, mulching and watering will be measured twice each season, typically in July and October, for a six month annual growing season from April 15 to October 15 each year.

E91. PLANT MATERIAL WARRANTY

DESCRIPTION

E91.1 General

E91.1.1 This Specification covers the provision of warranty for all plant material itemized on the Plant List:

(a) Plant Material shall be under warranty for two full years.

E91.1.2 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.

E91.2 Timing

E91.2.1 Warranty shall commence upon acceptance of installed plant material.

E91.3 Warranty

E91.3.1 The Contractor hereby warrants that the plant material as itemized on the Plant Lists and on the Drawings will remain free of defects for the maintenance period indicated for each area of the Contract.

E91.4 End-of-Warranty Inspection

E91.4.1 Contract Administrator reserves the right to extend the Contractor's warranty responsibilities for an additional year, at the end of the designated warranty period for the appropriate area, if at that time plant material leaf development and growth are not sufficient to ensure future survival.

E91.5 Replacement

E91.5.1 During the warranty period, remove from site any plant material that has died or failed to grow satisfactorily, as determined by the Contract Administrator and replace with healthy plant material of the same species and size.

E91.5.2 Replace plant material in the following spring or fall as directed.

E91.5.3 Extend warranty on replacement plant material for an additional period until the end of the specified warranty period or for one full growing season, whichever is the longer period.

E91.5.4 Continue such replacement and warranty until plant material is acceptable.

E91.5.5 Trees determined by the Contract Administrator to have been damaged by vandalism shall be replaced and such replacement trees will be paid for at the Contract Unit Prices for the species indicated on the Drawings.

MEASUREMENT AND PAYMENT

E91.6 Warranties on Plant Material

E91.6.1 Warranties on plant material will be incidental to the "Supply and Installation of Plant Material." No measurement and payment will be made for these Items of Work.

E92. CHEMICAL CONTROL OF VEGETATION

DESCRIPTION

E92.1 General

E92.1.1 This Specification covers the requirements for the application of herbicides for weed control.

E92.2 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.

E92.3 Safety Requirements

E92.3.1 Comply with Federal and Provincial, pesticide control regulations. Provide Material Safety Data sheets (MSDS) for all chemicals to be used.

E92.3.2 The pesticide applicator must be a Licensed Provincial Pesticide Applicator, as required by the Pesticides and Fertilizer Control Act of Manitoba

E92.3.3 Obtain any other permits and licenses necessary to complete work.

E92.3.4 Comply with label directions on the use of herbicide products.

E92.3.5 Comply with label directions as to ambient temperature ranges for application.

E92.4 Delivery and Storage

E92.4.1 Deliver, store and maintain packaged materials with manufacturer's seals and labels intact.

E92.4.2 Prevent damage, adulteration and soiling of material during delivery, handling and storage.

E92.4.3 Store material in accordance with label directions, including those on maximum and minimum storage temperatures.

E92.4.4 Store herbicide products in original containers as supplied by manufacturer and keep sealed until used.

E92.4.5 Store herbicide products in sheltered, well ventilated, controlled access location.

E92.4.6 Do not store herbicides near feeds and food stuffs, agricultural plants, seeds, fungicides, insecticides, fertilizers or other agricultural chemicals.

E92.4.7 Identify storage area as pesticide storage facility for fire protection purposes.

E92.4.8 Post in a prominent place a list of medical and fire department telephone numbers.

E92.4.9 Post in a prominent location on the outside of the storage area a list of products stored. Provide a copy of this list to fire department. Keep list up to date.

MATERIALS

E92.5 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.

E92.6 Herbicides

E92.6.1 Select appropriate herbicides to achieve specified control requirement. Refer to Manitoba Guide to Chemical Weed Control.

E92.6.2 Herbicide products used must be registered for such use by Agriculture Canada under Pest Control Products Act.

E92.6.3 Do not use herbicides containing sodium chlorate.

E92.7 Adjuvants

E92.7.1 Adjuvants shall be compatible with herbicide product used.

E92.8 Spray Equipment

E92.8.1 Tank Spray: Do not use airblast, mist or fog sprayer. Sprayer unit to meet the following requirements.

(a) Sprayer shall have adjustable height boom, hose and handgun for spot treatments, strainers and nozzles to produce spray pattern compatible with job.

(b) Tank shall be equipped with continuous agitation device.

(c) Pressure gauge and regulator shall be capable of maintaining uniform pressure between 100 and 450 kPa.

E92.8.2 Backpack Sprayer

(a) Sprayer shall have hose and handgun for spot treatment.

E92.8.3 Equip spray tank loading pipe with check valve located within one metre of pump or hydrant to prevent siphoning from spray tank resulting in contamination of water source.

CONSTRUCTION METHODS

E92.9 General

E92.10 Notice of Spray Operation:

E92.10.1 Post areas to be treated with signs placed at each road access and 100 m intervals around perimeter.

E92.10.2 Indicate on signs that spray program is being implemented.

E92.10.3 Put signs in place prior to commencement of spray operation and retain in place for 24 hours after spray operation is completed for each particular area.

E92.11 Environmental Protection:

E92.11.1 Application may continue only when wind velocities range between 2 and 10 km/h.

E92.11.2 Do not spray when air turbulence will prevent uniform application.

E92.11.3 Do not apply herbicides within 65m of wells, rivers, streams, lakes, marshes or other environmentally sensitive areas unless otherwise sanctioned by Provincial Permit.

E92.11.4 In case of herbicide spill, notify contract administrator and Manitoba Environment verbally immediately and subsequently in writing.

E92.11.5 Do not allow drifting beyond target area. Use mechanical method to minimize herbicide drift.

E92.11.6 When spraying adjacent to desirable vegetation, use sprayer fitted with a protective hood suitable to prevent contamination or provide protective covering for such vegetation while spray is in progress.

E92.11.7 Do not apply soil sterilants to slopes greater than 3 to 1 where killing vegetation would lead to erosion problems.

E92.12 Application of Herbicides

E92.12.1 Treat areas as indicated with appropriate herbicides.

E92.12.2 Herbicides to be applied at label rates.

E92.12.3 Calibrate equipment to achieve manufacturer's recommended application rates.

E92.12.4 Confine herbicide application to areas as indicated to achieve specified control requirements.

E92.12.5 Space successive passes to provide uniform coverage of treated area.

E92.12.6 Use flagmen or other aids as necessary to indicate successive passes.

E92.12.7 Where roots of desirable vegetation run under treatment area, use contact herbicides.

E92.12.8 Ensure formulation and rate of sterilant will not lead to leaching outside treatment area.

E92.12.9 Retreat areas in accordance with label directions until specified control requirements are achieved.

E92.12.10 Use flags or other aids as necessary to indicate successive passes

E92.13 Control Requirements

E92.13.1 For weed control, achieve within 30 days of treatment, minimum of 90% kill of target plants without damaging installed plant material or adjacent plant material to be retained.

E92.13.2 For soil sterilization, achieve within 12 months of treatment, 100% kill of vegetation.

E92.14 Waste Disposal

E92.14.1 Triple-rinse empty herbicide containers with dilutant and add rinsate to spray mixture in tank.

E92.14.2 Puncture and crush glass plastic metal containers making them unsuitable for further use.

E92.14.3 Dispose of containers in accordance with Provincial requirements.

E92.14.4 Do not rinse or wash spray tanks and equipment on site.

E92.15 Report

E92.15.1 Within 7 days of work completion, submit to Contract Administrator a written report containing following information:

(a) Full name and PCP Registration number of herbicide products used including adjuvants.

(b) Types and makes of application equipment used.

(c) Total amount of herbicide applied and rate of application expressed in kilograms of active ingredients per square metre and in kilograms of product per square metre.

(d) Dates and times treatment commenced and terminated each day.

(e) Summary of daily weather conditions during treatment.

(f) Number of square metres completed each day.

(g) Description of disposal techniques, total number of containers discarded for each chemical, exact location of disposal site.

(h) Names of drivers, mixers and applicators.

(i) Copies of Provincial Applicator's License and Pesticide Project Application Permit.

MEASUREMENT AND PAYMENT

E92.16 Chemical Control of Vegetation

E92.16.1 Broad scale application of chemical herbicides to seeded areas will be measured on a per unit basis and paid for at the Contract unit price per time for “Chemical Application of Herbicide” which will be payment in full for the supply of all labour, equipment and materials and performing all operations herein described, and all other items included in the Work of this specification.

E92.17 Spot Weed Control

E92.17.1 Application of chemical herbicides to control excessive weed growth in sod areas and in planting beds or around trees, following completion of planting operations will be incidental to “Long-Term Maintenance”. No measurement and payment will be made for this Item of Work.

MISCELLANEOUS WORKS

E93. REMOVE AND SALVAGE EXISTING OVERHEAD SIGN SUPPORT STRUCTURES

DESCRIPTION

E93.1 The Work covered under this item shall include all operations related to the removal and disposal or salvage of existing overhead sign support structures at the designated locations, in accordance with this Specification and as shown on the Drawings.

E93.2 The Work to be done by the Contractor under this Specification shall include the supply of all materials, and the furnishing of all superintendence, overhead, labour, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E93.3 Equipment

E93.3.1 All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E93.4 Removal of Sign Support Structures

E93.4.1 The Contractor shall submit a Removal Procedure Plan for each structure to be removed, including details of traffic control, to the Contract Administrator for review and approval. The Removal Procedure Plan shall be submitted at least twenty-one (21) days prior to removing the overhead sign structure to arrange for installation of temporary signs and de-energizing the power supply as well as review/approval by City of Winnipeg Traffic Management Engineer.

E93.4.2 The Contractor shall never lift an overhead sign structure or member over traffic.

E93.4.3 The City of Winnipeg Traffic Services Branch will supply and install temporary sign posts as required. The power supply to the existing overhead sign support structures designated for removal and disposal will be de-energized by the City of Winnipeg Traffic Signals Branch.

E93.4.4 The Contractor shall use a digital multimeter to verify that the electrical power supply to the structure has been de-energized prior to removal of the structure.

E93.4.5 The Contractor shall remove the existing sign support structures carefully without damaging the existing anchor bolts and adjacent property.

E93.4.6 All structures marked for disposal shall be hauled off site and disposed at an appropriate facility at the Contractor's expense. No separate payment will be made for disposal of the structure.

E93.4.7 All structures marked for salvaged, including hardware, shall be delivered to the City of Winnipeg Bridge Storage Yard at 849 Ravelston Ave. Winnipeg, MB, R3W 1S8. At the storage yard, the Contractor shall off-load the salvaged material with his own labour and equipment and place in the designated location indicated by the City Bridge Inspectors and as directed by the Contract Administrator.

E93.5 Removal of Sign Panels

E93.5.1 The Contractor shall remove the existing sign panels, including existing steel sign mounting brackets, and deliver all components to City of Winnipeg Traffic Services. The existing light fixtures and conduits shall be removed and disposed

E93.5.2 Any damage to the sign panels that has not been identified prior to removal will be repaired by Traffic Services at the Contractor's expense.

MEASUREMENT AND PAYMENT

E93.6 Remove and Salvage Existing Overhead Sign Support Structures

E93.6.1 Removal of existing steel overhead sign support structures shall 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, 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.

(a) Items of Work

i) Dugald Rd. E/B West of Plessis Rd.

E94. TRANSCONA BIZ PEDESTAL RELOCATION

DESCRIPTION

E94.1 General

E94.1.1 The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations and relocation of the Transcona BIZ pedestal in accordance with this Specification and as shown on the Drawings.

E94.1.2 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.

MATERIALS

E94.2 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.

E94.3 Cast-in-place concrete pile foundation

E94.3.1 Materials used for the installation of the cast-in-place concrete pile foundation shall be in accordance with E80.

E94.4 Base Plate and Plate Washers

E94.4.1 Steel for the base plate and plate washers for connecting the pedestal to the cast-in-place concrete pile foundation shall be in accordance with CSA G40.21 300W.

E94.4.2 The steel base plate and plate washers shall be hot-dip galvanized in accordance with ASTM A123 to a net retention of 610 g/m2.

E94.5 Post-Installed Anchors

E94.5.1 Threaded rod for post-installed anchors shall be stainless steel in accordance with ASTM F593.

E94.5.2 Adhesive for post-installed anchors shall be Hilti HIT-HY 200, or equal as approved by the Contract Administrator in accordance with B8.

CONSTRUCTION METHODS

E94.6 Cast-in-place concrete pile foundation

E94.6.1 Construction methods for the installation of the cast-in-place concrete pile foundation shall be in accordance with E80.

E94.7 Relocation of concrete pedestal

E94.7.1 The existing pole structure will be removed from the top of the concrete pedestal and refurbished by others.

E94.7.2 The Contractor shall carefully remove the existing concrete pedestal approximately 300 mm below grade by wire cutting, and store and protect the pedestal during the course of construction. The Contractor shall be responsible for the safekeeping of the pedestal for the duration of construction.

E94.7.3 Install the threaded rod to the underside of the pedestal using the adhesive anchoring system. The manufacturer's instructions are to be strictly followed.

E94.7.4 Fabricate and install the base plate to the post-installed threaded rods.

E94.7.5 Following installation of the concrete pile foundation, install the pedestal and base plate onto the foundation anchor bolts.

E94.7.6 The refurbished pole structure will be installed atop the pedestal by others.

MEASUREMENT AND PAYMENT

E94.8 Relocation of Transcona BIZ Pedestal

E94.8.1 Relocation of the Transcona BIZ Pedestal, including construction of a new cast-in-place concrete pile foundation shall not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for "Relocation of Transcona BIZ Pedestal", 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.

E95. SUPPLY AND INSTALLATION OF NEW STEEL OVERHEAD SIGN SUPPORT STRUCTURES

DESCRIPTION

E95.1 General

E95.1.1 The Work covered under this item shall include all operations related to the supply, fabrication, delivery, and erection of new steel overhead sign support structures.

E95.1.2 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 the Work as hereinafter specified.

MATERIALS

E95.2 General

E95.2.1 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.

E95.2.2 All materials used for fabrication of overhead sign support structures shall be new, previously unused material.

E95.3 Handling and Storage of Materials

E95.3.1 All materials shall be handled in a careful and workmanship-like manner, to the satisfaction of the Contract Administrator.

E95.4 Structural Steel

E95.4.1 Structural steel for all components of the overhead sign support structures 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 0 to 0.03% or 0.15 to 0.22% for monotubular shafts and arms, and to less than 0.3% for all other steel components.

E95.4.2 The Contractor is advised that copies of mill test certificates showing the chemical and physical properties of all structural steel to be supplied under this Specification must be supplied to the Contract Administrator and be found acceptable prior to commencement of fabrication.

E95.4.3 Steel shall not be acceptable unless the mill test certificate states the grade to be as indicated on the Drawings. Lower grade steel shall not be acceptable (despite favourable published mill test results). Items fabricated without steel certification shall be rejected.

E95.5 Flange Bolts, Nuts, and Washers

E95.5.1 Flange bolts, nuts, and washers shall be in accordance with ASTM A325, Type 1, hot-dip galvanized in accordance with ASTM F2329.

E95.5.2 Nuts shall be in accordance with ASTM A563 Heavy Hex Nuts, Grade DH.

E95.5.3 Washers shall be in accordance with ASTM A436 Type 1.

E95.6 Fasteners for Handhole Covers

E95.6.1 Fasteners for handhole covers shall be in accordance with ASTM A276 Type 316 stainless steel.

E95.7 Hot-Dip Galvanizing

E95.7.1 Hot-dip galvanizing of structural steel shall be in accordance with ASTM A123 for a minimum net retention of 610 g/m2.

E95.8 Galvanizing Touch-up and Repair

E95.8.1 Only approved products listed below shall be used for field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds.

E95.8.2 Approved paints containing zinc dust is as follows:

(a) ZINGA, as manufactured by ZINGAMETALL, Ghent, Belgium, available from Pacific Evergreen Industries Ltd. Vancouver, BC, Ph. (604) 926-5564, and Centennial Mine & Industrial Supply, Saskatoon, Sask., Ph. (306) 975-1944.

E95.9 Anchor Bolts, Nuts and Washers

E95.9.1 Anchor bolts including nuts and washers shall be in accordance with ASTM F1554 Grade 55 ksi (380 MPa), hot-dip galvanized in accordance with ASTM 2329. Anchor bolts, nuts, and washers, shall be supplied and paid for under, "New Cast-in-Place Concrete Pile Foundations", specified herein.

E95.9.2 Nuts shall be in accordance with ASTM A563 Heavy Hex Nuts, Grade DH.

E95.9.3 Where a plate washer detail is included in the Drawings, one such plate washer shall be used:

(a) between the lower leveling nuts and the base plate

(b) between the top nuts and the base plate

E95.9.4 Where no plate washer detail is shown on the Drawings, washers shall be in accordance with ASTM A436 Type 1.

E95.10 Setting Template

E95.10.1 Setting template shall be in accordance with CSA G40.21 Grade 300 W, hot-dip galvanized. Setting template shall be supplied and paid for under, "New Cast-in-Place Concrete Pile Foundations", specified herein.

E95.11 Non-Shrink Grout

E95.11.1 Grout as specified hereinafter shall be used for the construction of grout pads under sign structure base plates. Grout shall consist of a pre-mixed, non-metallic non-shrink grout. Approved products are:

(a) M-Bed Standard grout by Sternson Ltd.

(b) CPD Non-shrink grout by Master Builders

(c) Set Non-shrink grout by Master Builders

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

E95.11.2 The grout shall be of a consistency suitable for the application intended, as approved by the Contract Administrator.

E95.12 Sign Plates

E95.12.1 Sign plates will be supplied and installed by the City of Winnipeg Traffic Services Branch.

E95.12.2 Welding Consumables

E95.12.3 Welding consumables for all processes shall be certified by the manufacturer to be complying with the requirements of CSA Standard W59-M1984 and the following Specifications:

(a) Manual shielded metal arc welding (SMAW): All electrodes shall be basic-type electrodes conforming to CSA W48.1-M1991 or W48.3-M1982, classification E480XX, or imperial equivalent.

(b) Gas metal arc welding (GMAW): All electrodes shall conform to CSA W48.4-M1980, classification ER480S-X, or imperial equivalent.

(c) Flux cored arc welding (FCAW): All electrodes shall conform to CSA W48.5-M1982, classification E480XT-X or imperial equivalent. Electrodes shall be controlled by hydrogen (CH) designation.

(d) Submerged arc welding (SAW): All electrodes shall conform to CSA W48.6-M1980, classification F480X-EXXX or imperial equivalent.

(e) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46ºC.

(f) All electrodes, wires, and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -18ºC.

E95.12.4 The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for his approval at least two (2) days prior to the scheduled commencement of any fabrication.

E95.13 Miscellaneous Materials

E95.13.1 Miscellaneous material incidental to this Work shall be as approved by the Contract Administrator.

E95.14 Equipment

E95.14.1 All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E95.15 General Requirements

E95.15.1 Holes in the base plates shall be sized as shown on the Drawings, and provisions made for field erection must be accurate within plus or minus 13 mm between supports, without affecting final installation and load capacity.

E95.15.2 The base plates for the sign support structures shall be constructed to be fully compatible and mountable on the anchor bolts, provided in the foundations by the Contractor.

E95.15.3 Sufficient reinforced handholes and wiring holes shall be provided for lighting of the signs as shown on the Drawings. All wiring holes shall have threaded couplings. All unused coupling holes shall be capped with a threaded galvanized plug.

E95.15.4 The sign support structure shall be so fabricated that erection can be achieved by means of bolted connections.

E95.15.5 Each sign structure shall be provided with a "raised" structure identification number with a welding electrode in accordance with the details shown on the Drawings. The sign structure identification number shall be placed before hot-dip galvanizing.

E95.15.6 Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facilities shall be consulted regarding the size and location of these holes.

E95.15.7 Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing the sign structures.

E95.16 Fabrication

E95.16.1 All fabrication shall be carried out in accordance with this Specification and the Contract Drawings, as well as AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals - 2013 - 6th Edition, plus all subsequent revisions.

E95.16.2 The punching of identification marks on the members will not be allowed, except for the structure identification number.

E95.16.3 Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may approve remedial measures.

E95.16.4 Dimensions and fabrication details that control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

E95.16.5 All portions of the Work shall be neatly finished. Shearing, cutting, clipping, and machining shall be done neatly and accurately. Finished members shall be true to line, free from twists, bends, sharp corners, and edges.

E95.16.6 Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.

E95.16.7 All holes shall be free of burrs and rough edges.

E95.17 Welding

E95.17.1 Welding of steel structures shall be in accordance with CSA W59, "Welded Steel Construction."

E95.17.2 All seams shall be continuously welded and free from any slag and splatter. Longitudinal welds shall be a minimum of 60% penetration, except those within 200 mm of baseplates, flanges, and circumferential welds, which shall be 100% penetration. All circumferential groove welds shall be 100% penetration, and where circumferential welds are used at a butt joint, an internal backup strip shall be provided.

E95.17.3 Longitudinal seam welds in horizontal supports shall be located at the top of the horizontal members.

E95.17.4 All welds shall be ground smooth and flush with the adjacent surface prior to hot-dip galvanizing.

E95.18 Surface Preparation and Cleaning

E95.18.1 Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A123 and SSPC Specification SP:6, "Commercial Blast Cleaning," unless otherwise specified herein. The Contractor shall ensure that all exterior and interior surfaces of vertical support members of sign structures are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 610 g/m2. All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.

E95.18.2 The sandblasting and cleaning of sign structures shall be done in the shop.

E95.18.3 After the structures have been sandblasted they shall be thoroughly cleaned of all sandblasting abrasive and debris, with special attention paid to areas of the structure where sand and debris collect, including but not limited to behind the gusset plates, handholes and base plate.

E95.18.4 After the sign structures 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.

E95.19 Hot-Dip Galvanizing

E95.19.1 The hot-dip galvanizing plant shall be a Regular Member of the American Galvanizers Association, Inc.

E95.19.2 All outside surfaces of the overhead sign support structures shall be hot-dip galvanized in accordance with ASTM A123 to a minimum net retention of 610 g/m2.

E95.19.3 Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facility shall be consulted regarding the size and location of these holes. Holes shall be provided by drilling not burning.

E95.19.4 The galvanizing coating on outside surfaces of overhead sign support structures shall be generally smooth and free of blisters, lumpiness and runs. In particular, the outside surfaces of the bottom 2.5 m of the vertical support members shall have a smooth finish equal to the finish on hot-dipped galvanized handrails.

E95.19.5 In addition to the provision of corrosion protection by the galvanized coating, the aesthetic appearance of the structure after hot-dip galvanizing will also be a criterion in the acceptance or rejection of the galvanized coating. The galvanized coating on the entire structure shall have a uniform “silver” colour and lustre. Galvanizing with parts of the

structure having dull grey coating or streaks or mottled appearance will not be acceptable. If the galvanizing is rejected for aesthetic reasons, the Contractor shall rectify the appearance by applying spray-on molten zinc metallizing with 85/15 zinc/aluminum alloy. The metallizing shall be carried out in the shop before the structure is installed.

E95.19.6 Minor defects in the galvanizing coating shall be repaired as specified here below for "Field-Applied Touch-Up Galvanizing". The Contract Administrator shall be consulted before repairs are made.

E95.19.7 Other defects and contaminants in the galvanizing coating, such as heavy dross protrusions, flux inclusions and ash inclusions shall be grounds for rejection of the galvanizing coating system.

E95.19.8 The Contractor shall verify the thickness of galvanized coatings as part of their own quality control testing and make their results available to the Contract Administrator.

E95.19.9 All threaded couplings shall be rethreaded after the sign structures have been hot-dip galvanized.

E95.19.10 The sign structures shall be stored on timber blocking after hot-dip galvanizing.

E95.20 Delivery and Erection

E95.20.1 The Contractor shall notify the Contract Administrator at least two (2) Working Days in advance of the anticipated delivery to the Site and erection of the overhead sign support structures.

E95.20.2 The sign structures shall be lifted and secured with nylon ropes or other approved methods. Use of steel chains and steel hooks against hot-dip galvanized or powder coated surfaces will not be permitted. The structure components (shaft and arm etc.) shall be placed on timber blocking and secured with nylon ropes during their transportation to the Site.

E95.21 Anchor Bolt Installation

E95.21.1 Each anchor bolt shall be provided with two galvanized nuts: one nut below the base plate for levelling the structure, and one nut above the base plate for anchoring the structure. The anchor bolts shall have a minimum projection of 25 mm above the anchoring nuts. There shall be provision for maximum 50 mm thick grout pad under the base plate.

E95.21.2 The Contractor shall follow the following procedure for installation of the anchor bolt nuts:

(a) Verify that the nuts can be turned onto the bolts past the elevation corresponding to the bottom of each in-place leveling nut and be backed off by the effort of one person on a 305 mm (12 in) long wrench or equivalent (i.e., without employing a pipe extension on the wrench handle).

(b) Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the leveling nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and leveling nuts have become wet since they were first lubricated.

(c) Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation.

(d) Place washers on top of the leveling nuts (one washer corresponding to each anchor bolt).

(e) Install the base plate atop the leveling nuts, place structural washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the top nuts onto the anchor bolts.

(f) Tighten top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person on a 305 mm (12 in.) long wrench or equivalent. A start tightening pattern is one in which the nuts on

opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.

(g) Tighten leveling nuts to a snug-tight condition in a star pattern.

(h) Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on one flat with a corresponding reference mark on the base plate at each bolt.

(i) Using a hydraulic wrench, “cheater-bar” (pipe), or slugger bar, incrementally turn the top nuts using a star pattern until achieving the required nut rotation specified on the Drawings has been achieved. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the nut rotation.

E95.22 Structural Bolt Installation

E95.22.1 Structural bolts for flange and splice connections shall be tightened in accordance with the turn-of-nut method as follows:

(a) Alternately tighten all bolts to achieve a snug tight condition. The mating surfaces shall be in firm contact.

(b) Tighten all bolts in accordance with Table 1.

(c) Following tightening, check all bolts in the joint by hand using an ordinary wrench.

Table 1: Required turns past snug-tight for Turn-of-nut method.

Bolt Diameter *D* (inches)	**Bolt Length up to 4*D***		**Bolt Length over 4*D* to 8*D***		**Bolt Length over 8*D* to 12*D***	
	Length up to	Required Turns	Length Range	Required Turns	Length Range	Required Turns
1/2”	2”	1/3 ± 30°	2 to 4”	1/2 ± 30°	4 to 6”	2/3 ± 45°
5/8”	2.5”	1/3 ± 30°	2.5 to 5”	1/2 ± 30°	5 to 7.5”	2/3 ± 45°
3/4”	3”	1/3 ± 30°	3 to 6”	1/2 ± 30°	6 to 9”	2/3 ± 45°
7/8”	3.5”	1/3 ± 30°	3.5 to 7”	1/2 ± 30°	7 to 10.5”	2/3 ± 45°
1”	4”	1/3 ± 30°	4 to 8”	1/2 ± 30°	9 to 13.5”	2/3 ± 45°
1 1/8”	4.5”	1/3 ± 30°	4.5 to 9”	1/2 ± 30°	10 to 15”	2/3 ± 45°
1 1/4”	5”	1/3 ± 30°	5 to 10”	1/2 ± 30°	11 to 16.5”	2/3 ± 45°

E95.23 Installation of Sign Plates

E95.23.1 The City of Winnipeg will be responsible for installation of sign plates and/or panels.

E95.24 Grout Pads

E95.24.1 New grout pads shall be constructed under sign structure bases after erection has been completed to the satisfaction of the Contract Administrator incidental to the Work of this item.

E95.25 Galvanizing Touch up and Repair

E95.25.1 Any areas of damaged galvanizing on the sign structures shall receive field-applied touch-up galvanizing.

E95.25.2 Galvanizing touch-up and repair shall be performed in accordance with ASTM A780 as follows:

(a) For areas requiring repair less than 100 mm x 100 mm in extent, repair using paint containing zinc dust in accordance with ASTM A780 Annex A2.

(b) For areas requiring repair greater than 100 mm x 100 mm in extent, repair using sprayed zinc (metallizing) in accordance with ASTM A780 Annex A3.

E95.25.3 For pure zinc paint or spray 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 50.8 µm (2.0 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.

E95.25.4 For sprayed zinc (metallizing) repairs, the minimum coating shall be as specified herein for hot dip galvanizing.

E95.25.5 All costs associated with galvanizing touch up and repair shall be borne by the Contractor. No additional payment will be made.

E95.26 Quality Control

E95.26.1 General

(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 inspection approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.

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

E95.26.2 Welding Qualifications

(a) The Contractor shall produce evidence that the plant has recently been fully approved by the C.W.B. to the requirements of CSA W47.1 Division 2.1 for welding of steel structures.

(b) Approved welding procedures shall be submitted to the Contract Administrator prior to fabrication of any steel items.

E95.26.3 Testing

(a) In addition to the Contractor's own quality control testing of all materials, welding procedures and steel fabrication including hot-dip galvanizing will be inspected and tested by the Contract Administrator to ascertain compliance with the Specifications and Drawings.

(b) The Contract Administrator will hire a testing agency certified by the Canadian Welding Bureau to carry out shop fabrication inspection and testing before the overhead sign support structures are approved ready for installation of coating system. The inspector shall have access to all of the fabricator’s normal quality control records for this Contract, specified herein. Inspection and testing will include:

i) Visual inspection of 100 percent of welds.

ii) Ultrasonic testing of 100 percent of full penetration sections of longitudinal seam welds and circumferential butt welds.

iii) Magnetic particle testing of a random 10 percent of partial penetration sections of longitudinal seam welds.

iv) Ultrasonic testing of 25 percent of base plate and flange plate welds.

v) Inspection of hot-dip galvanizing and coating thickness.

(c) Welds that are found by any of the inspection and testing methods to be inadequate and unsatisfactory shall be repaired in accordance with CSA W59 and then retested. The cost of the repairs and the cost of the retest shall be paid for by the Contractor.

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

(e) Defects in hot-dip galvanizing shall be rectified as directed by the Contract Administrator.

E95.26.4 Unacceptable Work

(a) Any Work found to be unacceptable shall be corrected in accordance with CSA W59.

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

MEASUREMENT AND PAYMENT

E95.27 Supply and Installation of Steel Overhead Sign Support Structures

(a) Supply and installation of new steel overhead sign support structures as listed here below will be measured on a unit basis and will be paid for at the Contract Unit Price per each for the "Supply and Installation of Steel Overhead Sign Support Structures", 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.

i) S776 Dugald Road E.B. West of Plessis Road

E96. SIGN SUPPORT CLAMPS

DESCRIPTION

E96.1 General

E96.1.1 This Specification covers all operations relating to the installation of new sign support clamps.

E96.1.2 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.

E96.2 The Contractor shall install all new sign support clamps at the locations as directed by the Contract Administrator. The City shall supply all sign support clamps.

E96.3 All costs in connection with the installation of sign support clamps are incidental to the Contract.

E97. MISCELLANEOUS REMOVALS AND RELOCATIONS

DESCRIPTION

E97.1 General

E97.1.1 The Work shall include all operations related to miscellaneous removals and/or relocations as shown on the contract drawings in accordance with this Specification.

E97.1.2 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.

E97.2 References

E97.2.1 Manitoba Workplace Safety and Health Act, and all applicable National, Provincial and Municipal regulations.

CONSTRUCTION METHODS

E97.3 Landscape Planter Relocation

E97.3.1 Landscape planter relocation will be conducted in a manner so as not to cause undue damage. Final location will be identified by the Contract Administrator onsite.

E97.4 Landscape Boulder Relocation

E97.4.1 Landscape boulder relocation will be conducted in a manner so as not to cause undue damage. Final location will be identified by the Contract Administrator onsite.

E97.5 Transcona Community Path Sign Removal and Reinstallation

E97.5.1 Transcona Community Path sign to be removed and stored onsite at a location identified by the Contract Administrator. Sign to be reinstalled at location determined by the Contract Administrator.

E97.6 Grouted Rip Rap Removal

E97.6.1 Grouted rip rap removal will be performed at location identified by the Contract Administer. Contractor is responsible for removing Grouted Rip Rap from the site in accordance with CW 3235.3.1.

E97.7 Wood Fence Removal

E97.7.1 Wood fence removal is required at proposed connection to Paul Martin Drive. Contractor to remove fence section and establish end treatments utilizing existing fence posts or as directed by the contract administrator.

E97.8 Raised Speed Table Removals

E97.8.1 Raised speed table removals are required at on Bournais Drive and Rougeau Avenue, (locations shown in Appendix G). Contractor to remove speed tables, replace curb and sidewalk, and repave any areas damaged by the removals.

E97.9 Quality Control

E97.9.1 Inspection

(a) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection 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 approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E97.10 Access

E97.10.1 The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

MEASUREMENT AND PAYMENT

E97.11 Landscape Planter Relocation

E97.11.1 Landscape Planter Relocation will be measured on a unit basis and paid for at the Contract Unit Price per each for “Landscape Planter Relocation”, 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.

E97.12 Landscape Boulder Relocation

E97.12.1 Landscape Boulder Relocation will be measured on a unit basis and paid for at the Contract Unit Price per each for “Landscape Boulder Relocation” 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.

E97.13 Transcona Community Path Sign Relocation

E97.13.1 Transcona Community Path Sign Relocation will be measured on a unit basis and paid for at the Contract Unit Price per each for "Relocation of Transcona Community Path Sign", 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.

E97.14 Grouted Rip Rap Removal

E97.14.1 Grouted Rip Rap Removal will be measured on an area basis and paid for at the Contract Unit Price per square metres for "Grouted Rip Rap Removal", 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.

E97.15 Wood Fence Removal

E97.15.1 Wood Fence Removal will be measured on a length basis and paid for at the Contract Unit Price per metre for "Wood Fence Removal", 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.

E97.16 Raised Speed Table Removals

E97.16.1 Speed Table Removals will be measured on a length basis and paid for at the Contract Unit Price per metre for "Speed Table Removal", 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.

E98. SUBGRADE AND SUBBASE COMPACTION NEAR OIL LINES

DESCRIPTION

E98.1 General

E98.1.1 This Specification covers all operations relating to the subgrade and subbase compaction in close vicinity to either the Imperial Oil (Esso) or Shell oil lines in accordance with this Specification and as shown on the Contract Drawings. (CT-0042 and CT-0043)

E98.1.2 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.

E98.2 Referenced Standard Construction Specifications

(a) The latest version of the City of Winnipeg Standard Construction Specification CW 3110 – Sub-Grade, Sub-Base and Base Course Construction

(b) The latest version of the City of Winnipeg Standard Construction Specification CW 3170 – Earthworks and Grading

MATERIALS

E98.3 General

E98.3.1 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.

E98.4 In accordance with the latest version of the City of Winnipeg Standard Construction Specification CW 3110, Section 2 and CW3170, Section 5.

CONSTRUCTION METHODS

E98.5 In accordance with the latest version of the City of Winnipeg Standard Construction Specification CW 3110, Section 3 and CW 3170, Section 9.

E98.6 During the placement and compaction of the subgrade, subbase, or base course material above an oil line utility, the Contractor will not be permitted to utilize vibratory compaction to reach the required Standard Proctor Density, but rather will only be permitted to utilize static rolling compaction.

MEASUREMENT AND PAYMENT

E98.7 No additional measurement or payment will be made for the Work performed in accordance with this Specification.

APPENDIX 'A'

GEOTECHNICAL REPORT

APPENDIX 'B'

CN SAFETY REQUIREMENTS & WORK PERMIT FORM

APPENDIX 'C'

CONTINUOUS WELDING RAIL THERMAL EXPANSION

APPENDIX 'D'

CN CRUSHED ROCK BALLAST MATERIAL SPECIFICATION

APPENDIX 'E'

ALS ENVIRONMENTAL ANALYTICAL REPORT

APPENDIX 'F'

W.L. GIBBONS AND ASSOCIATES GROUNDWATER REPORT

APPENDIX 'G'

BOURNAIS DRIVE AND ROUGEAU AVENUE SPEED TABLE LOCATIONS