THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 9-2018

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

TABLE OF CONTENTS

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 30, 2018.

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

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

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the Bidder may attend a Site meeting from 1:30 PM to 3:00 PM on January 18, 2018. The Bidder is strongly advised to attend the Site Meeting as the logistics and site access are critical components of the project.

B3.2 The Bidder can access the Site via the winter road from Trans-Canada Highway#1 (49º 38’ 44.56” N, 95º 26’ 31.74”W).

B3.3 The coordinates of the Site can be obtained from the Drawings.

B3.4 The Bidder shall not be entitled to rely on any information or interpretation received at the Site Meeting 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 Bidders’ conference at 552 Plinguet Street from 9:30 PM to 10:30 PM on January 18, 2018.

B4.2 The Bidder is advised that, at the Bidders’ Conference, an overview of the contract documents, site logistics, as well as the security requirements will be presented

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 D3.1.

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;

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

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

(d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior

substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

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

B8.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.

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

B8.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

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 B18.

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.

B9. BID COMPONENTS

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

(a) Form A: Bid;

(b) Form B: Prices;

(c) Bid Security

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

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.

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.

B9.5 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 B18.1(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 (2) 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 13 of Form A: Bid shall be signed in accordance with the following requirements:

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

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

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

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

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 (2) 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.

B11.2 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. DISCLOSURE

B12.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B12.2 The Persons are:

(a) N/A

B13. QUALIFICATION

B13.1 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.

B13.2 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

B13.3 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);

B13.4 Further to B13.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

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

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR)

Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

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

B13.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B13.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

B14.1 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.

B14.1.1 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.

B14.1.2 All signatures on bid securities shall be original.

B14.1.3 The Bidder shall sign the Bid Bond.

B14.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B14.2 The bid security of the successful Bidder and the next two (2) 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.

B14.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B14.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B14.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B14.3 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.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 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.

B15.1.1 Bidders or their representatives may attend.

B15.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B15.3 After award of Contract, the name(s) of the successful Bidder(s), their address(es) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B16. IRREVOCABLE BID

B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two (2) 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.

B17. WITHDRAWAL OF BIDS

B17.1 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.

B17.1.1 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.

B17.1.2 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 13 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B17.1.3 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 13 of Form A: Bid; and

(c) if the notice has been given by any one of the persons specified in B17.1.3(b), declare the Bid withdrawn.

B17.2 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 B16.2 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.

B18. EVALUATION OF BIDS

B18.1 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 B13 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B8.

B18.2 Further to B18.1(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.

B18.3 Further to B18.1(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.

B18.4 Further to B18.1(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.

B18.4.1 Further to B18.1(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.

B19. AWARD OF CONTRACT

B19.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B19.2 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.

B19.2.1 Without limiting the generality of B19.2, the City will have no obligation to award a Contract where:

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

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

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

(d) only one Bid is received; or

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

B19.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2018 Capital Budget. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.

B19.4 The Work of this Contract is also contingent upon the approval of the Environmental Assessment.

B19.5 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 B18.

B19.5.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

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

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

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of the construction of a bridge crossing the Shoal Lake Aqueduct at mile 93 and associated roadworks.

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

(a) Supply and installation of steel bearing piles;

(b) Construction of concrete pile caps;

(c) Supply, assembly, and launching of the Acrow panel superstructure;

(d) Supply and installation of timber deck, back walls, and wing walls; and,

(e) Construction of approach roadways.

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is Dillon Consulting Limited, represented by:

Graeme Loeppky, P.Eng.
Project Manager

Telephone No. 204 453-2301 Fax No. 204 452-4452
Email Address gloeppky@dillon.ca

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

D4. CONTRACTOR'S SUPERVISOR

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

D5. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D5.1 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.

D5.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D5.3 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.

D5.4 A Contractor who violates any provision of D5 may be determined to be in breach of Contract.

D6. NOTICES

D6.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the facsimile number identified in D3.1.

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

The City of Winnipeg
Attn: Chief Financial Officer
Office of the Chief Administrative Officer
Susan A. Thompson Building
2nd Floor, 510 Main Street
Winnipeg MB R3B 1B9

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

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

Facsimile No.: 204 947-9155

D6.5 Bids Submissions must not be submitted to the above facsimile number. Bids must be submitted in accordance with B9.

D7. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

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

D9. SAFE WORK PLAN

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

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

D9.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D10. INSURANCE

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

(a) Wrap Up Liability insurance in the amount of not less than five million dollars ($5,000,000) inclusive per occurrence written in the name of the Contractor, sub-contractors, engineers and sub-consultants and the City, covering bodily injury, personal injury, property damage and products and completed operations endorsement such policy will add Manitoba as an additional insured. Wrap Up liability to also include cross liability clause, hook liability, contractual liability and to include a twenty-four (24) months completed operations endorsement.

(b) Automobile liability insurance for owned and non-owned automobiles used for or in connection with the Work in the amount of at least five million dollars ($5,000,000)

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

(d) All risks property insurance policy to contain a Waiver of Subrogation Rights against the City and against those for whom the City is, in law, responsible, whether any such damage is caused by the act, omission or fault of the City or by those for whom the City, in law, is responsible;

(e) Contractors Pollution Liability (CPL) insurance in the amount of at least two million dollars ($2,000,000) per occurrence and two million dollars ($2,000,000) aggregate insuring against claims for :

(i) Bodily injury,

(ii) Property damage including diminution if value and Natural Resource Damages

(iii) Clean-up costs

(iv) Transported cargo and non-owned disposal sites (blanket basis)

(v) 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.

(f) All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

(g) All policies shall be in a form satisfactory to the City and shall be kept in full force and effect during the Work.

D10.2 During the transportation of equipment, material, supplies and personnel via the GWWD Railway, the Contractor is to provide and maintain the following insurance coverage:

(a) Commercial general liability insurance, in the amount of at least two million dollars ($2,000,000) inclusive, with the City to be added as an additional insured, and including a cross liability clause and employers liability and reference to specify transportation via railway;

(b) All risk property policy carrying adequate limits to cover all machinery, equipment, supplies, and/or materials transported via railway and brought to the construction site;

(c) Property in transit for the full value of machinery, equipment and supplies while being transported via railway; and

(d) A signed waiver of liability and assumption of risk agreement prior to the transporting of any supplies, equipment, machinery, material and personnel.

D10.3 Deductibles shall be borne by the Contractor.

D10.4 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 Contract Administrator and the City.

D10.5 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.

D10.6 All policies must be taken out with insurer licenced to carry on business in the Province of Manitoba.

D11. PERFORMANCE SECURITY

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

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

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

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

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

D11.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B14.1(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.

D12. SUBCONTRACTOR LIST

D12.1 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.

D13. EQUIPMENT LIST

D13.1 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.

D14. DETAILED WORK SCHEDULE

D14.1 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.

D14.2 The detailed work schedule shall consist of the following:

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

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

all acceptable to the Contract Administrator.

D14.3 Further to D14.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

(a) Installation of steel piles;

(b) Supply and installation of cast-in-place concrete abutment;

(c) Supply and installation of the Acrow panel bridge;

(d) Supply and installation of timber deck, back walls, and wing walls; and,

(e) Construction of the approach roadway.

D14.4 Further to D14.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D15. ENVIRONMENTAL PROTECTION PLAN

D15.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of this Environmental Protection Plan as herein specified.

D15.2 The Contractor is advised that at a minimum the following Acts, Regulations and By-laws apply to the Work and are available for viewing on line at the applicable websites (www.canlii.org and/or http://clkapps.winnipeg.ca/dmis/) or at the office of the Contract Administrator.

D15.3 Federal

(a) Canadian Environmental Assessment Act (CEAA), 1992 c.37 (repealed, 2012, c.19, s. 66);

(b) Canadian Environmental Protection Act;

(c) Fisheries Act, 1985 c. F-14;

(d) Transportation of Dangerous Goods Act Regulations;

(e) Migratory Birds Convention Act, 1994 and Migratory Birds Regulations, c. 1035;

(f) Species at Risk Act, c. 29;

(g) Applicable Fisheries and Oceans Canada Operational Statements for Manitoba for temporary stream crossings;

(h) The Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guidelines, DFO 1995;

(i) Fisheries and Oceans Policy for the Management of Fish Habitat 1986;

(j) Federal Policy on Wetland Conservation 1991;

(k) Transportation Association of Canada: National Guide to Erosion and Sediment Control on Roadway Projects, 2005; and

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

D15.4 Provincial

(a) The Dangerous Goods Handling and Transportation Act, D12;

(b) The Endangered Species and Ecosystems Act, c. E111;

(c) The Heritage Resources Act, c. H39.1;

(d) The Noxious Weeds Act, c. N110;

(e) The Nuisance Act, c. N120;

(f) The Pesticides Regulation, M.R. 94/88R;

(g) The Public Health Act, c. P210;

(h) The Water Protection Act, c. W65;

(i) Workplace Safety and Health Act, c. W210;

(j) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba Natural Resources and DFO, 1996; and

(k) Current applicable associated regulations, any other applicable Acts, Regulations, and By-laws.

D15.5 Municipal

(a) The City of Winnipeg Neighbourhood Liveability By-law No. 1/2008;

(b) The City of Winnipeg Traffic By-law No. 1573/77 and all amendments up to and including 55/2011;

(c) City of Winnipeg Best Management Practices Handbook for Activities In and Around the City's Waterways and Watercourses, City of Winnipeg, 2005;

(d) City of Winnipeg Motor Vehicle Noise Policies and Guidelines; and

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

D15.6 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage:

Storage of construction materials and equipment shall be confined within a fenced area or at a location approved by the Engineer or Contract Administrator with environmental protection (e.g. silt fence) as appropriate.

Construction materials shall not be deposited or stored on or near watercourses unless written acceptance from the Contract Administrator is received in advance.

The Contractor shall tie down or secure construction materials and debris if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.

The Contractor shall prevent construction materials and debris from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor shall remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

(b) Fuel Handling and Storage:

The Contractor shall obtain all necessary permits from Manitoba Conservation and Water Stewardship for the handling and storage of fuel products and shall provide copies to the Contract Administrator.

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

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

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

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

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

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

Wash, refuel and service machinery and store fuel and other materials for the machinery 100 m away from the aqueduct and any watercourses to prevent deleterious substances from entering the water.

The Contractor shall distinctly mark the area around storage sites and fuel lines and keep the area clear of snow and debris to allow for routine inspection and leak detection.

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

Machinery shall arrive on Site in a clean condition and shall be maintained free of fluid leaks.

The Contractor shall store a sufficient supply of materials, such as absorbent material and plastic oil booms, nearby on Site to clean up minor spills. The Contractor shall ensure that additional material can be made available on short notice. Additionally, appropriate staff on Site shall be trained in proper handling of deleterious liquids (i.e., fuelling) and trained on how to prevent and clean-up minor spills.

(c) Waste Handling and Disposal:

The construction area shall be kept clean and orderly at all times and at the completion of construction.

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

The Contractor shall, during and at the completion of construction, clean up the construction area and all resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Waste Disposal Grounds Regulation, Manitoba Regulation 150/91. Exceptions are liquid industrial and hazardous wastes which require special disposal methods.

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

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

Indiscriminate dumping, littering, or abandonment shall not take place.

No burning of waste or other materials is permitted.

Clearing debris shall be disposed of by chipping and/or mulching with the material being used by the City of Winnipeg for future uses.

The Contractor shall use structurally suitable Site excavation material as fill within the project. Should excavated material exceed fill needs, the remainder would be stockpiled for use on other local projects.

Structurally unsuitable site excavation material shall be removed by the Contractor.

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

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

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

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

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

Flows shall be dissipated so that dewatering discharges minimize erosion at the discharge point.

(d) Dangerous Goods/Hazardous Waste Handling and Disposal:

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

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

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

Different waste streams shall not be mixed.

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

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

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

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

Dangerous goods/hazardous waste storage areas shall be located at least 100 m away from the aqueduct or the high water line and be diked.

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

Runoff from a dangerous goods/hazardous waste storage area shall not be allowed to cause siltation of a watercourse.

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

(e) Emergency Response:

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

The Contractor must report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table 1 below) to Manitoba Conservation and Water Stewardship, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 944-4888.

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

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

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

- Identify exact location and time of the accident.
- Indicate injuries, if any.
- Request assistance as required by magnitude of accident [Manitoba Conservation and Water Stewardship 24-hour Spill Response Line (204) 944-4888, Police, Fire Department, Ambulance, company backup].
- Your insurance company immediately.

(ii) Attend to public safety:

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

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

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

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

- Approach from upwind.
- Stop or reduce leak if safe to do so.
- Dike spill material with dry, inert absorbent material or dry clay soil or sand.
- Prevent spill material from entering waterways and utilities by diking.
- Prevent spill material from entering manholes and other openings by covering with rubber spill mats or diking.

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

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

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

(viii) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to with in-house

resources without formal notification to Manitoba Conservation and Water Stewardship.

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

Table 1 - Environmental Accident Reporting
Reportable Quantities of Spills that must be Reported to Manitoba Conservation and Water Stewardship
[(204) 944-4888]

Classification	Hazard	Reportable Quantity or Level
1	Explosives	All
2.1	Compressed Gas (Flammable)	100 L*
2.2	Compressed Gas	100 L*
2.3	Compressed Gas (Toxic)	All
2.4	Compressed Gas (Corrosive)	All
3	Flammable Liquids	100 L
4	Flammable Solids	1 Kg
5.1 Packing Groups I and II	Oxidizer	1 Kg or 50 L
Packing Group III	Oxidizer	5 Kg or 50 L
5.2	Organic Peroxide	1 Kg or 1 L
6.1 Packing Group I	Acute Toxic	1 Kg or 1 L
Packing Groups II and III	Acute Toxic	5 Kg or 5 L
6.2	Infectious	All
7	Radioactive	Any discharge or level exceeding 10 m Sv/h at the package surface and 200 uSv/h at 1 m from the package surface
8	Corrosive	5 Kg or 5 L
9.1	Miscellaneous (except PCB Mixtures)	50 Kg
9.1	PCB Mixtures	500 grams
9.2	Aquatic Toxic	1 Kg or 1 L
9.3	Wastes (Chronic Toxic)	5 Kg or 5 L

* Container Capacity (refers to container water capacity)

Source: *Environmental Accident Reporting Regulation M.R. 439/87*

(f) Noise and Vibration:

Noise generating activities shall be limited to the hours indicated in the City of Winnipeg Neighbourhood Liveability By-law No. 1/2008. The activities shall generally be restricted between 7:00 a.m. and 7:00 p.m. weekdays with written permission of the Contract Administrator and the City of Winnipeg for any after-hours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities.

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

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

Construction vehicles and equipment will adhere to posted speed limits.

The Contractor shall monitor the vibration at the aqueduct from pile installation and construction work. The maximum vibration on the aqueduct shall not exceed 6 mm/second.

(g) Dust and Emissions:

Construction vehicles and machinery shall be kept in good working order by the Contractor through the use of inspection and maintenance.

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

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

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

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

Stockpiled soils shall be wetted down or covered with tarpaulin covers to prevent the creation of dust, when appropriate.

(h) Erosion Control:

The Contractor shall develop a sediment control plan prior to beginning construction in adherence with the Transportation Association of Canada: National Guide to Erosion and Sediment Control on Roadway Projects, 2005 and to the satisfaction of the Contract Administrator.

Sediment control shall be applied to all in water works to prevent the release or re-suspension of sediments to the watercourse. A turbidity curtain shall be used to contain sediments from coffer dam construction/removal and riprap placement, if warranted. This turbidity curtain should isolate as small an area as possible to complete the works, and should be completely removed once turbidity within the isolated area has returned to background levels.

The Contractor shall inspect all sediment control structures daily during heavy construction activity in the areas of the structures and after a heavy rainfall to ensure their continued integrity.

Exposure of soils along drain slopes shall be kept to the minimum practical amount, acceptable to the Contract Administrator.

Effective sediment and erosion control measures (e.g., straw mulch, erosion control blankets, interceptor ditches) shall be used both during construction and until vegetation is re-established to prevent sediment-laden runoff from entering, wetlands and other watercourses.

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

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

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

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

Construction activities shall be avoided during periods of high winds to prevent erosion and the creation of dust.

(i) Runoff Control:

Measures shall be undertaken to ensure that runoff containing suspended soil particles is minimized from entering the land drainage system to the extent possible to the satisfaction of the Contract Administrator.

Areas that are heavily disturbed and vulnerable to erosion or gullying shall be diked to redirect surface runoff around the area prior to spring runoff.

Construction activities on erodible slopes shall be avoided during spring runoff and heavy rain falls.

Soil and fill shall not be stockpiled on immediate watercourse bank areas.

(j) Fish:

The Contractor shall adhere to all of the protection measures below; adhere to the Fisheries and Oceans Canada. No Net Loss Policy for fish habitat.

Due to the presence of spawning fish species no in-stream works will occur between April 1 and June 15 of any given year.

If possible, bridge works shall be constructed during periods of no flow or very low flow. Flowing water should be diverted around the construction area using a dam and bypass pump or temporary flume (culvert). Water shall be diverted in a manner that avoids sediment generation to downstream areas and does not alter the volume of flow in the watercourse. Use coffer dams made of non-earthen material such as aquadams, sand bags, sheet pile or clean granular material wrapped in poly-plastic or other suitable isolation materials. Ensure any pump inlets are appropriately screened following the Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guidelines. Ensure all isolation materials are completely removed from the watercourse once construction is complete.

Any fish trapped within the isolated area shall be captured and returned to the watercourse unharmed. Fish includes fin fish, crayfish and mussels (clams).

All bridge works shall be limited to within road's right-of-way.

A buffer of vegetation shall be maintained when working along waterways, where possible.

Culverts shall be installed according to the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat (Manitoba Natural Resources and DFO, 1996). The culverts shall be embedded a minimum of 0.3 m or 10% of culvert vertical diameter, whichever is greater to maintain connectivity during lower flows in this forage fish stream.

The duration of Work and amount of disturbance to the bed and banks of the water body shall be minimized.

Use only clean rock for armouring the channel areas, and haul it in from an appropriate land-based source. Avoid using poor quality limestone that breaks down quickly when exposed to the elements or acid generating rocks typical from metal mines. All rock shall be clean and free of fine materials and of appropriate size to resist displacement during high flow events.

The rock shall be placed such that it does not constrict the channel or change the hydraulics in a way that might damage the bed and/or banks of the watercourse or interfere with fish passage.

Where grading of stream banks is required, they shall be sloped by pulling material back from the water's edge. Stabilize any waste materials removed from the Work site,

above the ordinary high water mark, to prevent them from entering any water body. Spoil piles shall be contained with silt fence, flattened, covered with biodegradable mats or tarps, and/or planted with preferably native grass or shrubs.

Excavation of the water body bed shall be limited to within the road right of way and is the minimum required for the proper placement of the culvert crossing.

Shoreline vegetation shall be retained to the greatest extent possible to maximize the stability of the banks.

Operate machinery from outside of the water and in a manner that minimizes disturbance to the banks of the water body.

The intake of any pumps used in surface waters shall be screened to meet the Department of Fisheries and Oceans' Freshwater Intake End-of-Pipe Fish Screening Guidelines (1995) and water withdrawal rates shall not exceed 10% of the instantaneous stream flow at the time.

(k) Wildlife:

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

No one shall disturb, move or destroy migratory birds' nests.

If a nest is encountered, Work shall cease in the immediate area and the Contract Administrator shall be contacted for further direction.

In the event that species at risk are encountered during the project construction, all Work shall cease in the immediate area, the Site shall be made safe and the Contract Administrator shall be contacted.

(l) Wetlands:

The Contractor shall implement the following environmental protection measures to prevent the new loss of wetland functions, in accordance with the Federal Policy on Wetland Conservation:

(i) The Contractor shall clearly mark wetland limits near the construction footprint prior to commencement of the Work and the wetland limits shall remain marked throughout the construction period.

(ii) Wetlands shall not be disturbed without written permission from the Contract Administrator.

(iii) Should additional wetlands be encountered during construction, construction in that area shall halt until the area is properly marked.

(iv) Construction equipment shall avoid the marked wetland areas as much as possible, where feasible.

(v) The Contractor shall not discharge water into adjacent wetlands without written permission from the Contract Administrator, having confirmed the quality of the water to be discharged and the capacity of the receiving wetland.

(vi) Any fish located within the wetlands to be disturbed by the project shall be captured and returned to a nearby watercourse unharmed.

(m) Vegetation:

The Contractor shall clearly mark the disturbance limit prior to commencement of the Work and the disturbance limit shall remain marked throughout the construction period.

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

The Contractor shall limit the removal of trees and snags (standing dead trees); surface disturbance and vegetation clearing.

Herbicides and pesticide shall not be used adjacent to any surface watercourse.

Trees or shrubs shall not be felled into watercourses.

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

Trees damaged during construction activities shall be examined by bonded tree care professionals. Viable trees damaged during construction activities shall be pruned according to good practices by bonded tree care professionals.

(n) Landscaping:

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

Topsoil shall be stripped prior to construction and salvaged for use during landscaping. Surplus topsoil shall be properly stockpiled for use in other projects.

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

(o) Heritage Resources

If heritage material is located during the construction and soil removal process, all Work shall cease and the Contractor shall immediately contact the Contract Administrator. The Historic Resource Branch, Manitoba Culture, Heritage, Tourism and Sport or the Project Archaeologist, shall be contacted by the Contract Administrator to determine the nature and extent of the archaeological material and to arrange for its recovery. The archaeological remains shall be recovered by salvage excavation upon authorization by the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Culture, Heritage, Tourism and Sport.

The Contractor shall be prepared to continue his Work elsewhere on the project while the Archaeologist investigates the find and determines its heritage value.

The Contractor is advised that he may be denied access to such areas of the project until such time as a thorough archaeological investigation is conducted or the find is deemed to have no heritage value.

Construction and excavation Work shall not resume until the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Culture, Heritage, Tourism and Sport, or the Project Archaeologist, authorizes a resumption of Work.

If human remains are uncovered during the construction and soil removal process, all Work shall cease and the Heritage Resources Branch, Manitoba Culture, Heritage, Tourism and Sport shall be contacted by the Contract Administrator. The Historic Resources Branch shall contact the City of Winnipeg Police.

If the human remains are not considered forensic, (i.e., no foul play suspected), they shall be removed by the Historic Resources Branch, Manitoba, Culture, Heritage, Tourism and Sport or the Project Archaeologist and turned over to the Province.

If the human remains are considered forensic, the City of Winnipeg Police shall be responsible for their removal.

Additional information may be obtained by contacting: Archaeological Assessment Services, Historic Resources Branch.

(p) Construction Traffic

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

Large equipment shall be equipped with flashing beacons and/or an audible “back up” warning device that is audible when the transmission is in reverse.

The Contractor shall adhere to the Standard Provisions of the Standard Construction Specifications, and of the Manual of Temporary Traffic Control in Work Areas on City Streets of the City of Winnipeg Public Works Department.

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

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

(q) Access

The Contractor shall maintain access to affected residential properties.

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

D15.7 Environmental Approvals

(a) The Contractor shall adhere to conditions specified in any and all permits, authorizations, licences, approvals and letters of advice or directive issued for the Work.

(b) Where the City applies for permits, authorizations, licences, approvals and letters of advice or directive to any regulatory body to facilitate the Contractor's work plan, there shall be no award for damages, delay claims or other costs by the Contractor on the City as a result of delays in issuance or rejections of applications.

(c) For all temporary work and construction activities the City will apply for required authorizations, permits, and approvals. Contractors must supply detailed schedules and work plans to facilitate these applications and cooperate with additional information requests from regulatory bodies. It may take up to 90 or more business days to process applicable authorizations, permits required. The contractor is bound by all conditions specified in regulatory directives applicable to the work. The City shall not be held responsible for any delays related to approvals.

SCHEDULE OF WORK

D16. COMMENCEMENT

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

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

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

(i) evidence of authority to carry on business specified in D8;

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

(iii) the Safe Work Plan specified in D9;

(iv) evidence of the insurance specified in D10;

(v) the performance security specified in D11;

(vi) the Subcontractor list specified in D12;

(vii) the equipment list specified in D13;

(viii) the detailed work schedule specified in D14; and,

(ix) The Environmental Protection Plan specified in D15.

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

D16.3 The City intends to award this Contract by February 20, 2018

D16.4 If the actual date of award is later than the intended date, the dates specified for Commencement, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D17. SUBSTANTIAL PERFORMANCE

D17.1 The Contractor shall achieve Substantial Performance by July 15, 2018.

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

D17.3 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.

D18. TOTAL PERFORMANCE

D18.1 The Contractor shall achieve Total Performance by July 31, 2018.

D18.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D18.3 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.

D19. LIQUIDATED DAMAGES

D19.1 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 Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

(a) Substantial Performance – One thousand Five Hundred dollars ($1500);

(b) Total Performance – One thousand Five Hundred dollars ($1500);

D19.2 The amounts specified for liquidated damages in D19.1 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.

D19.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D20. JOB MEETINGS

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

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

D21. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D21.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

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

D22.1 Further to B13.4, 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 B13.4.

D23. LAYOUT OF THE WORK

D23.1 Further to C6, the centrelines, working points, alignments, and elevations of the works are shown on the Drawings.

D23.2 The Contractor shall be responsible for the true and proper layout of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. The Contractor shall provide all required instruments and competent personnel for performing all layouts.

D23.3 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at their own expense.

D23.4 The Contract Administrator shall be notified at least one (1) Working Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.

D23.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items used in giving the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

D23.6 The Contractor shall arrange and carry out his Work so as not to conflict with the collection of any data in anyway by the Contract Administrator. The Contractor shall adjust Work and/or remove any interference as directed by the Contract Administrator at the expense of the Contractor.

MEASUREMENT AND PAYMENT

D24. PAYMENT

D24.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D25. WARRANTY

D25.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D25.2 Notwithstanding C13.2 or D25.1, 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.

D25.2.1 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. 9-2018

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

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

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 9-2018

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

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

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D12)

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

Name	Address

FORM K: EQUIPMENT
(See D13)

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

SHOAL LAKE AQUEDUCT CROSSING AND ASSOCIATED ROADWORKS

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

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

E1.3 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
00	Cover Sheet
CS-01	General Arrangement
CS-02	Bore Hole Details 1 of 3
CS-03	Bore Hole Details 2of 3
CS-04	Bore Hole Details 3 of 3
CS-05	Abutment and Pile Details
CS-06	Abutment Reinforcement Details
CS-07	Backwall Details
CS-08	Bearing Details
CS-09	Deck and Guardrail Details 1 of 2
CS-10	Deck and Guardrail Details 2 of 2
CS-11	Erosion Control
CT-01	Plan and Profile
CT-02	Signage Plan

E2. SOILS INVESTIGATION REPORT/GEOTECHNICAL REPORT

E2.1 Further to C3.1, one (1) geotechnical report is provided to aid the Contractor's evaluation of the existing soil conditions. The geotechnical report is contained in Appendix 'B'.

GENERAL REQUIREMENTS

E3. MOBILIZATION AND DEMOBILIZATION

E3.1 Description

E3.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E3.1.2 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 hereinafter specified.

E3.2 Scope of Work

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

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

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

(iii) Maintaining and removing any access roadways; and,

(iv) Restoring all Site facilities.

E3.3 Materials

E3.3.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials to be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E3.3.2 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.

E3.3.3 The Contractor’s Site supervisor is required to carry, at all times, a cellular telephone, with voicemail.

E3.3.4 This section also includes travel and accommodation, set-up and demobilization of Site offices, storage conveniences and other temporary facilities, construction plant, and other items not required to form part of the permanent works and not covered by other prices.

E3.4 Equipment

E3.4.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E3.5 Construction Methods

E3.5.1 Layout of On-Site Work Facilities

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

(b) Possible locations for the Contractor’s staging are at least 15 m away from the aqueduct and within the City of Winnipeg Right of Way. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas; and,

(c) The staging area shall be a minimum of 3.6 m away from the nearest Greater Winnipeg Water District Railway Track.

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

E3.5.2 Secure Site Fencing

(a) A minimum 1.2 m high orange snow fence shall be installed around the site lay-down and Work site areas shall be installed prior to commencement of site activities;

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

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

E3.5.3 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; and,

(c) Upon completion of the Work, the area shall be restored to its original condition. The Limits of Work Area will be reviewed at the Pre-Construction Meeting. If the Contractor requests a Change in the Limits of the Work Area, they shall do so formally in writing at least ten (10) Business Days prior to mobilization. The Contract Administrator will respond within five (5) Business Days with a response; the Contract Administrator has the right to dismiss the request.

E3.5.4 Restoration of Existing Facilities

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

E3.6 Temporary site access and site work roads

E3.6.1 The Contractor shall provide site work roads or platforms required to facilitate the construction of the new bridge and shall have dimensions, geometry, slope, drainage and base material designed and constructed by the Contractor for the size and weights of his equipment.

E3.6.2 The Contractor shall re-establish vegetation, using a grass seed mix acceptable to the Contract Administrator in all areas of the construction site and access roads that have been disturbed or damaged during construction in accordance with Specification CW 3520.

E3.6.3 The Contractor shall ensure that the existing temporary construction accesses are suitable for the work, and provide modifications if required.

E3.6.4 Maintenance, modifications to, and removal of the existing temporary site access roads, or any other temporary access facilities is considered incidental to "Mobilization and Demobilization", and no separate measurement or payment will be made.

E3.7 Quality Control

E3.7.1 Inspection

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

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given.

(c) The Contract Administrator reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification.

E3.7.2 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.

E3.8 Measurement and Payment

E3.8.1 Mobilization and demobilization will not be measured and will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E3.8.2 Mobilization and demobilization will be paid for at a percentage of the Contract Lump Sum Price, measured as specified herein. These percentages shall be as follows:

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

(b) 60% during construction, percentage distributed equally on a monthly basis, at the discretion of the Contract Administrator; and,

(c) 10% upon completion of the project.

E4. SHOP DRAWINGS

E4.1 Description

E4.1.1 This Specification provides instructions for the preparation and submission of shop drawings.

(a) 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; and,

(b) Submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be show on all submissions for Contract Administrator review.

E4.2 Shop Drawings

E4.2.1 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.

E4.2.2 Shop drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

(a) Temporary Shoring, as requested by the Contract Administrator;

(b) All Form Details, as requested by the Contract Administrator; and,

(c) Metal Fabrications, Layout, and Erection Details for Miscellaneous Metal.

E4.3 Contractor’s Responsibilities

E4.3.1 Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

E4.3.2 Verify:

(a) Field Measurements;

(b) Field Construction Criteria; and,

(c) Catalogue numbers and similar data.

E4.3.3 Coordinate each submission with requirements of Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.

E4.3.4 Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

E4.3.5 Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator’s review of submission, unless Contract Administrator gives written acceptance of specified deviations.

E4.3.6 Responsibility for errors and omissions in submission is not relieved by Contract Administrator’s review of submittals.

E4.3.7 Make any corrections required by the Contract Administrator and resubmit the required number of corrected copies of shop drawings. Direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

E4.3.8 After Contract Administrator’s review and return of copies, distribute copies to Subcontractors and others as appropriate.

E4.3.9 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.

E4.4 Submission Requirements

E4.4.1 Schedule submissions at least fourteen (14) Calendar Days before dates reviewed submissions 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 Documents.

E4.4.2 Submit one (1) digital version of any shop drawings provided. Where file size limits the use of electronic mail distribution, shop drawings shall be submitted through an alternate system as agreed upon between the Contractor and Contract Administrator, such as USB external hard disk or CD-ROM. After the review period is complete, the Contract Administrator will return a digital copy of the shop drawings on an electronic format of the Contract Administrator's discretion.

E4.4.3 Upon request by the Contract Administrator, submit two (2) paper prints of any shop drawings provided. After the review period is complete, the Contract Administrator will retain one (1) copy of the paper print shop drawings and return one (1) copy to the Contractor.

E4.4.4 Accompany submissions 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; and,

(g) Other pertinent data.

E4.4.5 Submissions 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)

(d) Identification of product or material;

(e) Relation to adjacent structure or materials;

(f) Field dimensions, clearly identified as such;

(g) Specification section name, number and clause number or drawing number and detail / section number;

(h) Applicable standards, such as CSA or CGSB numbers; and,

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

E4.5 Other Considerations

E4.5.1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.

E4.5.2 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.

E4.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

E4.5.4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.

E5. OFFICE FACILITIES

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

E5.1.1 The field office shall be for the exclusive use of the Contract Administrator.

E5.1.2 The building shall be conveniently located near the Site of the Work.

E5.1.3 The building shall have a minimum floor area of 25 m², a height of 2.4 m with two windows for cross ventilation and a door entrance with a suitable lock.

E5.1.4 The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between sixteen (16) and twenty-five (25) degrees Celsius.

E5.1.5 The building shall be adequately lighted with fluorescent fixtures and have a minimum of three (3) wall outlets.

E5.1.6 The building shall be furnished with one (1) desk, one (1) table 3 m x 1.2 m, one (1) drafting table, one (1) four (4) drawer legal size filing size filing cabinet with lock, and a minimum of five (5) chairs.

E5.1.7 Provide a small fridge, microwave, water cooler with disposable cups and coffee maker.

E5.1.8 A portable toilet shall be located near the field office building for the exclusive use of the Contract Administrator. The toilet shall have a locking door.

E5.1.9 The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.

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

E5.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance or as agreed upon in writing by the Contract Administrator.

E5.4 No separate measurement or payment will be made for performing all operations herein described and all other items incidental to the Work described.

E6. VERIFICATION OF WEIGHTS

E6.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer and Corporate Affairs, Canada.

E6.2 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

E6.3 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

(a) Checking Contractor's scales for Consumer and Corporate Affairs certification seals;

(b) Observing weighing procedures;

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

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

E6.4 No charge shall be made to the City for any delays or loss of production caused by such inspection and verification.

E6.5 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.

E6.6 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

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

(b) The mechanically printed tare weight;

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

(d) The time and date of weighing.

E6.7 No separate measurement or payment will be made for performing all operations herein described and all other items incidental to the Work described.

E7. SURFACE RESTORATIONS

E7.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E8. BRIDGE SITE SECURITY

E8.1 During the project the Contractor shall be responsible for maintaining only authorized Site access twenty-four (24) hours a day. Any existing security fencing, etc. that may be altered during construction will need to have an equivalent replacement upon the completion of the Project.

E8.2 No separate measurement or payment shall be made for this work.

E9. ENVIRONMENTAL PROTECTION

E9.1 The Contractor shall plan and implement the Work of this Contract in strict accordance with the Environmental Protection Specifications as outlined in Supplemental Condition D15: Environmental Protection Plan.

E9.2 No in-water work is to occur.

E9.3 Environmental protection for bridge substructure construction shall meet the following conditions.

E9.3.1 Substructure construction for the new bridge includes excavation and construction of new pile foundations, pile caps, and abutments. Construction practices, including limited access and minimal disturbance of vegetation, shall follow the erosion and sedimentation control measures indicated on the Drawings and in accordance with these specifications. All areas disturbed during construction are to be restored or temporarily protected, in accordance with these specifications to accommodate the spring flood flows.

E9.3.2 The Contractor shall ensure that the point of discharge from seepage, melt or runoff water pumped from any excavation is a minimum of 20 m from the edge of the waterway high water mark. The Contractor shall ensure that water discharge onto the channel bank or at any other locations is done so in a manner that does not cause any erosion of the ground and prevents water containing excessive sediment from directly entering the waterbody. This shall be done to the satisfaction of the Contract Administrator.

E9.4 Temporary Access Road Works

E9.4.1 Construction and maintenance of any temporary access roads within the City of Winnipeg Right of Way will extend throughout the contract period and will follow approved environmental protection practices for access road works and in these Specifications.

E9.5 Fuel Storage

E9.5.1 Diked fuel storage and refuelling must be located a minimum of 100 m from the waterway.

E9.6 Site Restoration

E9.6.1 Soil placement area adjacent to the bridge contract limits is to be protected in accordance with erosion and sedimentation control specifications for channel works, including interim and long-term environmental protection measures. Erosion and sedimentation control measures to be implemented by the Contractor at the end of contract are to be determined by the Contract Administrator. Coordination with adjacent Contractors will be required.

E9.7 All water intakes must be screened according to DFO's Freshwater Intake End-of-Pipe Fish Screen Guidelines.

E9.8 Any on-site concrete batch plants shall have a current Environment Act License or be in the process of obtaining a license at the time of bidding. The plant must have a current license prior to commencing on-site operation. Water intakes shall be appropriately screened in accordance with E9.7 and no washwater shall be released into any waterway.

E9.9 Roadworks – Grade Construction

E9.9.1 Construction of roadworks shall follow approved environmental protection practices for roadworks as indicated on drawings and in these specifications.

E9.9.2 Borrow excavation area shall to be protected in accordance with erosion and sedimentation control specifications for channel works including interim and long-term environmental protection measures. Erosion and sedimentation control measures to be implemented by the bridge Contractor at the end of contract are to be determined by Contract Administrator. Coordination with adjacent contractors will be required.

E9.10 The Contractor shall monitor the vibration at the aqueduct from pile installation and construction work. The maximum vibration on the aqueduct shall not exceed 6 mm/second.

E9.11 No separate measurement or payment will be made for performing all operations herein described and all other items incidental to the Work described.

E10. WORK BY OTHERS AND WORK WITH OTHERS

E10.1 The Contractor is advised that for the purpose of this Contract he/she shall become the Prime Contractor upon entering the site for the first time.

E10.2 The Contract Administrator will provide two (2) survey control reference points for the Contractors use.

E10.3 The Contractor is advised that other Contractors may be working near the project site and on the winter road during the execution of this Contract. It will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area and such cooperation is an obligation of the Contractor under the terms of this Contract.

E11. STRUCTURAL BACKFILL, QUARRIED ROCK TRAFFIC GRAVEL,CRUSHED ROCK (100 MM MINUS), AND SHOT ROCK / CRUSHED ROCK (300 MM MINUS)SUPPLIED BY SHOAL LAKE FIRST NATION

E11.1 Description

E11.1.1 This specification shall cover Loading, Hauling and Placing for all Structural Backfill, Quarried Rock Traffic Gravel, Crushed Rock(100 mm Minus), and Shot rock/Crushed Rock (300 mm Minus) materials supplied by Shoal Lake No. 40 First Nation including Load, Haul and Place the materials.

E11.2 Material

E11.2.1 Shoal Lake No. 40 will be producing the Structural Backfill, Quarried Rock Traffic Gravel, Crushed Rock(100 mm Minus), and Shot rock/Crushed Rock (300 mm Minus) materials for the construction of the bridge over Shoal Lake aqueduct and associated roadworks.

E11.3 Construction Methods

E11.3.1 The Contractor will be required to load at the stockpile, haul, place and compact if necessary the applicable material roadway and bridge construction material for each applicable component of bridge and roadway construction.

E11.3.2 The material is to be obtained from the stockpile site located approximately 500 m from the bridge site.

E11.3.3 The Contractor is responsible for all loading, unloading, hauling, and placing required to construction the approach roadways and granular backfill.

E11.3.4 The Contractor is responsible for the maintenance of the existing haul roads to the quarry.

E11.3.5 Crushed Rock shall be used in the embankment as produced. The Contractor shall not separate or screen out any portion of the crushed rock nor blend in any extraneous granular material before placing it in the embankment.

E11.3.6 Road Pad/Embankment Construction

(a) The rock pad is to provide a stable surface on which to construct the rock embankment and shall be placed in a controlled manner so that the peat compresses evenly. The Contractor shall take all necessary precautions to prevent rips and tears of the geotextile fabric and failure of the peat due to overloading with rock fill or heavy equipment.

(b) The initial layer of solid rock shall be placed by lightweight tracked (wide pad) equipment which exerts a ground pressure not exceeding 35 kPa. The rock shall be end dumped by hauling equipment, as approved by the Engineer. The rock shall be dumped rock no closer than 15 m from the advancing leading edge of fill prior to being dozed ahead. The full width of the rock pad shall be advanced evenly along the entire width of the road.

(c) The initial embankment thickness shall be between 0.6 m and 1.1 m. Once the initial lift has been completely placed across the entire width of the rock pad, a waiting period of approximately one (1) to three (3) days, subject to performance (i.e., review of rock settlement) as determined by the Contract Administrator, will be required prior to placing any additional lifts.

(d) Oversized rock shall not be used to construct the rock pad.

(e) The Contractor to provide benching when constructing embankment adjacent to the existing or new rail embankment.

E11.3.7 Traffic Gravel, Class “D” shall be deposited during frost free condition at a time approved by the Contract Administrator.

E11.3.8 The Contractor shall apply water and compact the Traffic Gravel, to a minimum density of 95% AASHTO standard dry density.

E11.3.9 Road Pad/Embankment Construction

E11.4 Measurement and Payment

E11.4.1 All material supplied by Shoal Lake No. 40 First Nation will be measured, and the volume computed from cross sections taken before each component of the work has started and again after each component of the work has been completed.

E11.4.2 Structural Backfill will be paid for at the Contract Lump Sum Price for "Load, Haul and Place Structural Backfill", which will be payment in full for performing all operation herein described and all other items incidental to the Work.

E11.4.3 Load, Haul and Place of Shot Rock/Crushed Rock (300 mm Minus) will be paid for at the Contract Unit Price for "Load, Haul and Place Shot Rock/Crushed Rock (300 mm Minus)" measured as in-placed constructed volume, which will be payment in full for performing all operation herein described and all other items incidental to the Work.

E11.4.4 Load, Haul and Place Traffic Gravel will be paid for at the Contract Unit Price for "Load, Haul, and Place Traffic Gravel" measured as compacted in-placed compacted volume, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

E11.4.5 Load, Haul, Place Crushed Rock(100 mm Minus) will be paid for at the Contract Unit Price for "Load, Haul, Place Crushed Rock(100 mm Minus)" measured as compacted in-placed as-constructed volume, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

E12. STRUCTURAL EXCAVATION

E12.1 Description

E12.1.1 The Work under this Specification shall include the following:

(a) Excavation required for constructing the abutments as shown on the Drawings;

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

(c) The Contractor shall include construction access for all excavation works required for construction;

(d) The off-site disposal of surplus and unsuitable material; and,

(e) Dewatering and/or precipitation removal at the excavations as may be required for construction of the structure in the dry.

E12.1.2 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.

E12.2 References

E12.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CW 3110 – Subgrade, Sub-Base, and Base Course Construction; and,

(b) CW 3170 – Earthwork and Grading.

E12.3 Submittals

E12.3.1 The Contractor shall submit the following to the Contract Administrator seven (7) Days prior to mobilization on-site:

(a) Plan(s) highlighting the Site Layout which includes; laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits, and gate locations for review and approval; and,

(b) Shop drawings for the temporary shoring in accordance with E4.2 for information purposes, bearing the seal of a Professional Engineer registered in the province of Manitoba:

E12.4 Equipment

E12.4.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E12.5 Materials

E12.5.1 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 workmanship like manner, to the satisfaction of the Contract Administrator.

E12.5.2 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 City for any materials taken by the Contract Administrator for testing purposes.

E12.5.3 Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, earth, gravel, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, or all other material of whatever character which may be encountered.

E12.6 Construction Methods

E12.6.1 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.

E12.6.2 All material shall be brought to the surface by approved method, and shall be disposed of off-site.

E12.6.3 After each excavation is completed, the Contractor shall notify the Contract Administrator.

E12.6.4 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.

E12.6.5 All excess excavated material shall become the property of the Contractor and shall be removed from the Site.

E12.6.6 The use of sheet piling cofferdams or other shoring for excavations is at the discretion of the Contractor.

E12.6.7 The design of cofferdams and shoring is the responsibility of the Contractor. The suitability and safety of excavations with or without cofferdams and/or shoring, is the responsibility of the Contractor and must meet Manitoba Workplace Health and Safety requirements.

E12.6.8 If cofferdams are used, the Contractor shall ensure to the satisfaction of the Contract Administrator, that the design and construction is done in a manner that maintains fish passage and does not cause erosion or sediments from directly entering the water body.

E12.6.9 No in water work shall be permitted.

E12.6.10 The Contractor shall ensure that the point of discharge from seepage, melt or runoff water pumped from any excavation is a minimum of 20 m from the edge of the waterway high watermark. The Contractor shall ensure that water discharge onto the channel bank or at any other locations is done so in a manner that does not cause any erosion of the ground and prevents water containing excessive sediment from directly entering the waterbody. This shall be done to the satisfaction of the Contract Administrator.

E12.7 Measurement and Payment

E12.7.1 The excavation required for the construction of the bridge abutments and riprap placement will not be measured and paid for at the Contract Lump Sum Price for "Structural Excavation", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E13. BENCH CUTS

E13.1 Bench cuts should be provided when fill material is being placed on a side fill including side slopes of the rail embankment.

E13.2 Bench cuts shall consist of excavating horizontal cuts into the slopes of the existing highway embankment prior to placing widening material thereon. Bench cuts shall be made at vertical intervals of 1.0 m, with the base of the initial bench cut being approximately 0.5 m above the toe of the existing slope. The base of each bench cut shall extend into the existing slope a minimum of 2 m. Suitable material resulting from the bench cut shall be incorporated and compacted into the new embankment. Unsuitable material shall be disposed of as directed by the Contract Administrator.

E13.3 The Contractor shall ensure that the base of the bench cut is sufficiently stable to accommodate compaction of the first lift of fill thereon.

E13.4 Contractor shall take extra precautions to preserve the existing rail and its embankment, so that it is not disturbed from its original position, nor contaminate with non-granular materials.

E13.5 No separate payment will be made for bench cuts.

E14. STRUCTURAL BACKFILL

E14.1 Description

E14.1.1 The Works in this section include the following:

(a) Granular Backfill required around the abutments in the vicinity of the bridge as shown on the Drawings and to the requirements of this Specification; and,

(b) For winter construction, heat subgrade and granular backfill prior to placement.

E14.1.2 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.

E14.2 References

E14.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CW 3110 – Subgrade, Sub-Base, and Base Course Construction;

(b) CW 3170 – Earthwork and Grading; and,

(c) CW 3130 – Supply and Installation of Geotextile Fabrics.

E14.3 Equipment

E14.3.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E14.4 Materials

E14.4.1 Granular Material

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

(b) All materials shall be accepted by the Contract Administrator at least fourteen (14) Days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense;

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

(d) All granular backfill, including levelling base fill, shall be hard, durable crushed granite aggregate, clean and free from organic material, meeting the gradation requirements of CW3110, 100 mm. The Contractor may be permitted to use CW3110, 50 mm aggregate, meeting the above requirements, if approved in writing by the Contract Administrator.

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

E14.4.2 Geotextile Fabric

(a) Geotextile fabric placed along the limits or within structural backfill shall be “Separation Geotextile Fabric” supplied in accordance with CW 3130; and,

(b) Supply of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

E14.5 Construction Methods

E14.5.1 Granular Backfill Material

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

(b) All granular backfill material shall be supplied, placed, and compacted in lifts of 150 mm (maximum) to a minimum of 98% of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time;

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

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

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

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

E14.5.2 Heating for Granular Backfill

(a) In locations of frozen subgrade, the Contractor shall preheat the subgrade prior to placement of granular backfill such that a minimum of 300 mm of unfrozen subgrade material is present during placement and compaction of granular backfill;

(b) The Contractor shall pre-heat all granular backfill such that it is placed and compacted in an unfrozen state;

(c) For subsequent lifts of granular backfill, the previous lift(s) will be considered the subgrade, and the requirements for unfrozen subgrade shall apply; and,

(d) Heating for Granular Backfill shall be considered incidental to Structural Backfill.

E14.5.3 Installing Geotextile Fabric

(a) Geotextile fabric shall be installed in accordance with CW 3130, and as shown on the Drawings; and,

(b) Installation of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

E14.6 Quality Control

E14.6.1 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.

E14.6.2 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.

E14.6.3 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.

E14.7 Measurement and Payment

E14.7.1 The backfilling required around the abutments in the vicinity of the bridge as shown on the Drawings will be measured and paid for in accordance with E11.

E15. SUBDRAINS

E15.1 Description

E15.1.1 Further to the City of Winnipeg standard specification CW 3120 the following shall apply.

E15.2 Construction Methods

E15.2.1 Installation of Drainage Fabric

(a) Install drainage fabric in the longest continuous practical length, free from tension, stress, folds, wrinkles and creases;

(b) Overlap joints a minimum of 600 mm;

(c) Install pins and place piles of drainage material as required to hold the drainage fabric in place;

(d) Wrap the drainage fabric around the drainage material;

(e) Cut drainage fabric as required to accommodate installation around existing gas lines. Patch the cut drainage fabric by overlapping piece of fabric to a minimum 600 mm or as recommended by the manufacturer and approved by the Contract Administrator; and,

(f) Remove and replace drainage fabric that has been improperly installed or damaged as directed by the Contract Administrator. Install drainage fabric in the longest continuous practical length, free from tension, stress, folds, wrinkles and creases.

E15.2.2 Installation of Drainage Pipe

(a) Install drainage pipe to line and grade shown on the Drawings or as directed by the Contract Administrator;

(b) Assemble pipe in accordance with manufacturer's instructions so when complete the drainage pipe will have a smooth and uniform invert;

(c) Install drainage pipe on 100 mm of drainage material ensuring uniform support under bell and pipe body throughout full length;

(d) Use longest pipe length manufactured where practicable to reduce number of joints on the sub-drain;

(e) Commence installation of drainage pipe at lowest point and proceed upgrade;

(f) Lay drainage pipe with bell upgrade;

(g) Install caps on ends of all sub-drains and secure to drainage pipe in accordance with manufacturer's recommendations;

(h) Allowable variance from specified line to be +/- 100 mm;

(i) Allowable variance from specified grade to be +/- 25 mm; and,

(j) Correct alignment and grade exceeding the allowable variance as directed by the Contract Administrator.

E15.2.3 Placement of Drainage Material

(a) Complete placement of drainage material in 150 mm lifts and compact to the satisfaction of the Contract Administrator; and,

(b) Place drainage material to ensure no damage occurs to the drainage fabric and drainage pipe.

E15.2.4 Subdrain Connections, Penetrations and Terminations

(a) Install subdrains complete with all necessary connections, penetrations through concrete or other elements, and terminations in accordance with the Drawings; and,

(b) All subdrain connections, penetrations and terminations shall be considered incidental to the Work and no separate payment will be made.

E15.3 Measurement and Payment

E15.3.1 Subdrain will be measured and paid for as described in CW 3120.

E16. ROCK SOCKETED STEEL PIPE PILE

E16.1 Description

E16.1.1 This Specification shall cover all operations related to supply and installation of rock socketed steel pipe piles for abutments and wing-walls, 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.

E16.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, supplying, handling, hauling, storing, equipment, tools, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E16.2 Definitions

E16.2.1 All related definitions are as follow:

(a) Overburden: All material encountered above the bedrock including imported fill and native soils;

(b) Weathered Rock Zone: Weathered rock encountered above the sound bedrock including voids, soil filled cavities, or boulders which requires temporary or permanent steel casing to support the pipe pile hole;

(c) Sound Rock: Rock which may contain fractures but a casing is not required to support the pipe pile hole.

E16.3 References

E16.3.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CAN/CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practice for Concrete;

(b) CAN/CSA A23.3, Design of Concrete Structures;

(c) CAN/CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement;

(d) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(e) CAN/CSA G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles; and,

(f) RSIC, Reinforcing Steel Manual of Standard Practice .

E16.4 Materials

E16.4.1 General

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

E16.4.2 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CAN/CSA A23.1. Materials damaged by careless or negligent handling or storage by the Contractor shall be replaced at the Contractor's expense.

E16.4.3 Testing and Approval

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

(b) All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damage 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.

E16.4.4 Steel Pipe Piles

(a) Steel Pipe Piles shall be 324 mm diameter x 13 mm thick permanent pipe pile as indicated on drawings, conforming to CSA G40.21 Grade 350W. Steel pipe piles shall be hot dip galvanized for the top 5.5 m of the pile length.

(b) Galvanizing shall be in accordance with CSA G164.

E16.4.5 Cement

(a) Cement shall be Type HS or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of CAN/CSA A23.1.

E16.4.6 Concrete

(a) General

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

(ii) Concrete shall be placed by the Tremie method if the pipe pile excavation cannot be kept free of water.

(b) The Contractor shall be responsible for the design and performance of all concrete mixed supplied under this Specification. Ether ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CAN/CSA A23.1:

(i) Class of Exposure: S-1;

(ii) Compressive Strength fifty-six (56) days = 35 MPa;

(iii) Water/Cementing Materials Ratio = 0.4;

(iv) Air Content: Category 2 per Table 4 of CAN/CSA A23.1 (four (4) to seven (7) percent); and

(c) Cement: shall be as specified in E16.4.5Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.

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

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

(f) The temperature of concrete shall be between $15^{o}C$ and $25^{o}C$ at discharge. Temperature requirements for concrete containing silica fume shall be between $10^{o}C$ and $18^{o}C$ at discharge unless otherwise approved by the Contract Administrator.

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

E16.4.7 Aggregates

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

(b) Coarse Aggregate

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

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

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

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

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

(c) Fine Aggregates

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

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

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

E16.4.8 Cementing Materials

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

(b) Silica Fume

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

(c) Fly Ash

(i) Fly ash shall be Type C1 or Type F and shall not exceed twenty-five (25) percent by mass of cement.

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

E16.4.9 Admixtures

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

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

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

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

(e) 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.

E16.4.10 Water

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

E16.4.11 Concrete Supply

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

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

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

E16.4.12 Reinforcing Steel

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

(b) All reinforcing steel shall conform to the requirement of CAN/CSA G30.18 Grade 400W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars.

(c) Reinforcing steel supply and installation will be incidental to the construction of concrete pile foundation and no separate payment will be made.

E16.5 Construction Methods

E16.5.1 Location and Alignment of Piles

(a) The piles shall be located at the positions shown on the Drawings or as directed by the Contract Administrator. Piles shall be installed vertically unless shown otherwise on the Drawings, and shall not deviate more than 2% out-of-plumb. Battered piles shall be installed to the battered specified on the Drawings, and shall not deviate more than two percent (2%) from the batter specified. Piles shall not be more than 75 mm off centre measured at cut-off elevation.

(b) Piles shall not be jacked or pulled into their final positions.

(c) The Contract Administrator may require additional embedment into the bedrock if, in the opinion of the Contract Administrator, it is necessary in order to reach an acceptable quality of sound bedrock.

E16.5.2 Dewatering

(a) Any water present within the caisson holes shall be pumped out and removed from site.

(b) The pipe pile shall be dewatered to facilitate rock socket inspection by the Contract Administrator.

E16.5.3 Placing Reinforcing Steel

(a) Reinforcement shall be:

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

(ii) Rigidly fastened together; and

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

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

E16.5.4 Placing Concrete

(a) Concrete shall not have a free fall of more than 2.0 meters 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.

(b) 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.

(c) The shaft shall be free of water prior to placing 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.

(d) 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.

E16.5.5 Tremie Concrete

(a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

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

E16.5.6 Protection to Newly Placed Concrete

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

E16.5.7 Curing Concrete

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

(b) Concrete shall be protected from the harmful effects of sunshines, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.

E16.5.8 Cold Weather Concreting

(a) Protection of concrete shall be considered to its placement. The temperature of the concrete shall be maintained at or above $10^{o}C$ for a minimum of three (3) days or until the concrete has reached a minimum compressive strength of 20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.

E16.6 Quality Control

E16.6.1 All workmanship and all materials finished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or 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.

E16.6.2 The Contractor shall replace any piles, or add additional pile(s), for piles that do not meet the following tolerances: +/-2% out of alignment for battered piles, +/-2% out of plumb for vertical piles, and 75 mm off centre of the specified locations. Any modifications required to the pile cap, due to piles out of tolerance or due to required additional piles to compensate for out of tolerance piles, shall be carried out as specified by the Contract Administrator at the Contractor's own costs.

E16.6.3 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All materials shall be free of surface imperfections and other defects.

E16.6.4 Concrete quality control testing shall be performed in accordance with the quality control requirements of E17.

E16.7 Measurement and Payment

E16.7.1 Supply of steel pipe piles shall be paid at the Contract Unit Price per linear meter for "Supply Steel Pipe Piles" in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E16.7.2 Installation of steel pipe pile shall be paid at the Contract Unit Price per linear meter for "Installation of Steel Piles" in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E16.7.3 The steel pipe piles shall be set to the elevations shown on the drawings. All costs associated with the pipe pile cut-offs shall be incidental to the appropriate Contract Unit Price for "Installation of Steel Piles".

E16.7.4 Supply and placement of concrete in steel pipe piles is incidental to the "Installation of Steel Piles" and no separate measurement or payment will be made.

E16.7.5 Supply and placement of reinforcement in steel pipe piles will be measured and paid according to the Specification E18, "Supply and Placing Reinforcing Steel".

E16.7.6 Condemned piles will be considered incidental to the Work and no separate measurement or payment will be made.

E17. STRUCTURAL CONCRETE

E17.1 Description

E17.1.1 This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings.

E17.1.2 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.

E17.1.3 Scope of Work

(a) The Work under this Specification shall include:

(i) Supplying and placing structural concrete for abutments.

E17.2 Submittals

E17.2.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations; and,

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to the commencement of any Work on Site, the proposed materials to be used.

E17.2.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used; the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

(b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes and may be used as information related to supplementary testing and investigation of suspected defective concrete. The City of Winnipeg will advise the Supplier if the information needs to be released to third parties. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:

(i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;

(ii) Designated size, or sizes, of aggregates, and the gradation;

(iii) Aggregate source location(s);

(iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;

(v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;

(vi) The limits for slump;

(vii) The limits for air content; and,

(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of fourteen (14) 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 of the concrete types.

(i) 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 A23.1-14 Clause 4.3.2.3.2; and,

(ii) 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.

E17.2.3 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) 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 the form. At the discretion of the Contract Administrator, if the Contractor can demonstrate a relationship between the plastic concrete properties at the point of discharge into the formwork and the end of the chute of the delivery truck, the Contract Administrator may accept test results at the end of the chute with the appropriate adjustments to the wet concrete performance requirements as being representative of what is in the formwork.

(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.

E17.2.4 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.

E17.2.5 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 falsework, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

E17.2.6 Design Requirements

(a) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(b) The falsework, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. Falsework shall be designed according to the requirements of CSA S269.1-16, “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.

(c) The falsework, 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 (R2013). All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval.

(d) The loads and lateral pressures outlined in Part 4, Guide to Formwork for Concrete, (ACI 347R-14) 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 the above reference shall apply.

(e) As a minimum, the following spacing’s shall apply for studding and walers:

(i) 20 mm plywood:

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

(f) 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.

(g) 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.

(h) 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.

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

(j) 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.

(k) Shores shall be braced horizontally in two (2) directions and diagonally in the same two (2) vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

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

(m) 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.

(n) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.

E17.2.7 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. Falsework 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.

E17.2.8 For timber formwork and falsework, 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.

E17.3 Materials

E17.3.1 General

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

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

E17.3.2 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanship like manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-14.

E17.3.3 Concrete

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

(b) Concrete shall have nominal compressive strengths (f'_c) and meet the requirements for hardened concrete as specified in Table E17.1.

TABLE E17.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content [%]	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	Abutment	35 @ 56 Days	S-1	5-8	20 mm	N/A	N/A

(c) Design Requirements

(i) The Contractor shall design falsework, formwork and shoring for the bridge deck slab overhang.

E17.3.4 Working Base Concrete

(a) Working base concrete shall be placed in the locations as shown on the Drawings.

(b) Working base shall be concrete meeting the requirements of CAN/CSA A23.1-14, for S-1 class of exposure, except as follows:

(i) 20 MPa at twenty-eight (28) days.

E17.3.5 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two (2) sizes of

coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

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

(iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CSA A23.1-14, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 µm sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-14, Table 12.

(c) Coarse Aggregate - Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-14, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 µm 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 (2) fractured faces; and shall have an absorption not exceeding 3%.

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

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

(iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-14, Table 12, for concrete exposed to freezing and thawing.

E17.3.6 Admixtures

(a) Air-entraining admixtures shall conform to the requirements of ASTM C260/C260M-10a (2016).

(b) Chemical admixtures shall conform to the requirements of ASTM C494/C494M -17 or C1017/C1017M – 13e1 for flowing concrete.

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

E17.3.7 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CSA-A3001 and shall be free from lumps.

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

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

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

E17.3.8 Water

(a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1-14 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.

E17.3.9 Formwork

(a) Formwork materials shall conform to CSA Standard A23.1-14, and American Concrete Publication SP4, “Formwork for Concrete.”

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-14, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-14. Approved Manufacturers are “Evans” and “C-Z.”

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

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

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

(g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 mm x 150 mm.

(i) Stay-in-place formwork or falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E17.3.10 Form Coating

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

E17.3.11 Permeable Formwork Liner

(a) 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.

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

E17.3.12 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-11.

(b) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B8.

E17.3.13 Curing Blankets

(a) Curing blankets for wet curing shall be 100% 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.

E17.3.14 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with 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 twenty-eight (28) days in age.

(b) Bonding Grout

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

- 1 part water;
- 1 part latex bonding agent; and,
- 1½ parts Type GUSF Portland cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E17.3.15 Epoxy Adhesive

(a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B8.

E17.3.16 Epoxy Grout

(a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B8.

E17.3.17 Cementitious Grout

(a) Cementitous grout shall be nonshrink and nonmetalic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B8. The minimum compressive strength of the grout at twenty-eight (28) days shall be 40 MPa.

E17.3.18 Patching Mortar

(a) Patching mortar shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.

E17.3.19 Damp-proofing

(a) Damp-proofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Damp-proofing materials shall be mineral colloid emulsified asphalt. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B8.

(b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of damp-proofing.

(c) Primer for damp-proofing shall be asphalt primer, penetrating type. Acceptable products are Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof and Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B8.

E17.3.20 Miscellaneous Materials

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

E17.3.21 Benchmark Plugs

(a) Benchmark plugs shall be supplied by the City of Winnipeg. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be determined by the Contract Administrator.

E17.4 Equipment

E17.4.1 General

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

E17.4.2 Vibrators

(a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309R. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.

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

E17.5 Construction Methods

E17.5.1 General

(a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.

E17.5.2 Temporary False Work, Formwork, and Shoring

(a) Construction Requirements

(i) The Contractor shall construct falsework, formwork and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted shop drawings;

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

(iii) The falsework, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted shop drawings;

(iv) Forms shall be constructed and maintained so that the completed Work is within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings;

(v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads;

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

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

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

(ix) Shores shall be braced horizontally in two (2) directions and diagonally in the same two (2) vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected;

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

(xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings; and,

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

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

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

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

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

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

(g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

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

(i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two (2) panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.

(j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the Site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

E17.5.3 Concrete Construction Joints

(a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

(b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

(c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.

(d) Refer to E17.5.8, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E17.5.4 Permeable Formwork Liner

(a) Permeable formwork liner shall be used on all exposed surfaces, except on soffit surfaces, or surfaces where a normal an architectural form finish is specified.

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

(c) The supply, setup, application, and removal of permeable formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E17.5.5 Control Joint Seals

(a) Formed control joints sealant for all horizontal, vertical and sloping joints shall be applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended.

(b) Form control joints shall be thoroughly cleaned before sealing.

E17.5.6 Benchmarks

(a) The Contractor shall install benchmark plugs supplied by the Contract Administrator at such locations on the structure as may be directed by the Contract Administrator.

E17.5.7 Supply of Structural Concrete

(a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.

(b) All mixing of concrete must meet the provisions of CSA A23.1-14, Clause 5.2, Production of Concrete.

(c) Time of Hauling

(i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume, this requirement is reduced to 90 minutes.

(ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement twenty-four (24) hours prior to the scheduled placing of concrete.

(iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.

(iv) Unless otherwise noted in Table E17.1, "Requirements for Hardened Concrete", no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-14 5.2.5.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the City upon request.

(d) Delivery of Concrete

(i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

(i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:

- Limit the amount to be placed at any time (using adequate construction joints);
- Augment his facilities and Plant in order to complete the proposed placement; and,
- In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.

(ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E17.5.8 Preparation for Concreting Against Hardened Concrete

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

(i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris;

(ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues;

(iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle; and,

(iv) For the Bridge median slab, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E17.5.9 Placing Structural Concrete

(a) General

(i) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.

(b) Placing Structural Concrete

(i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m^2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.

(ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-14 shall be used to estimate surface moisture evaporation rates.

(iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.

(iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.

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

(vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.

(vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or “cold joints” within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.

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

(x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.

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

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

(xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

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

E17.5.10 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

(i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and

screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.

(b) Type 1 Finish – Exposed Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes;

(ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations;

(iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner; and,

(iv) The surfaces shall be patched as specified in this Specification.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces shall be finished as outlined hereinafter;

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations;

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated; and,

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish - Surfaces Below Finished Grade

(i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E17.3.14, E17.3.15, E17.3.18 and E17.5.13 of this Specification.

(ii) All surfaces below 300 mm below finish grade shall receive damp-proofing in accordance with E17.3.19 of this Specification.

(e) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

(ii) The supply, set up, operation, and finishing of working base concrete shall be considered incidental to the works of this specification, and no separate measurement or payment shall be made for this Work.

E17.5.11 General Curing Requirements

(a) Refer to E17.5.14 for cold weather curing requirements and E17.5.15 of this Specification for hot weather curing requirements.

(b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, damp-proofing, a waterproofing membrane, or an asphalt overlay.

(c) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations and continuously wetted for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.

(d) Curing compound shall be applied at the rate required by ASTM C156 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

(e) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of twenty-four (24) hours. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.

(f) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3ºC in one hour or 20ºC in twenty-four (24) hours.

(g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator.

(h) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.

(i) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

E17.5.12 Form Removal

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.

(b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.

(c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for deck extensions shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads. Bridge deck overhang forms shall be loosened before forms are constructed and concrete is placed for bridge traffic barriers. Stripping of these forms shall not be permitted until a concrete strength of 28 MPa has been achieved by the deck slab concrete and the concrete bridge traffic barriers.

(d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E17.5.13 Patching of Formed Surfaces

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.

(b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.

(c) Patching of formed surfaces shall take place within twenty-four (24) hours of formwork removal.

(d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.

(e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one (1) hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

(g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E17.5.14 Cold Weather Concreting

(a) The requirements of CSA Standard A23.1-14 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5°C during placing and/or curing or if there is a probability that the ambient temperature during the time of concrete placement will drop to or below 5°C.

E17.5.15 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures is higher than 25°C during placing or if there is a probability that the ambient temperature during the time of concrete placement will rise to or above 25°C.

(ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.

(iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.

(iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.

(v) Sun shades and wind breaks shall be used as required during placing and finishing.

(vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

(vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.

(viii) Hot weather curing shall follow immediately after the finishing operation.

(b) Hot-Weather Curing

(i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.

(ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

(i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

(d) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E17.2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

TABLE E17.2: ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION	**TEMPERATURE °C**	
	MINIMUM	**MAXIMUM**
<1.0 m	10	27
<1.2 m	5	25

E17.5.16 Clean-up

(a) The Contractor shall clean-up equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E17.6 Concrete Quality

E17.6.1 Inspection

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

(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.

E17.6.2 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 of Winnipeg for samples taken.

E17.6.3 Materials

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

(b) All materials shall conform to CSA Standard A23.1-14.

(c) All testing of materials shall conform to CSA Standard A23.2-14.

(d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E17.6.4 Quality Assurance and Quality Control

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

(b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

(f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-14. An outline of the quality tests is indicated below.

E17.6.5 Concrete Testing

(a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-14, "Slump of Concrete". If the measured slump falls outside the limits in E17.2.2 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-14, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E17.2.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457/C457M-16. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-14, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract

Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(d) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202-17 and shall meet the requirements of each class of concrete.

(e) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-14, "Sampling Plastic Concrete".

(f) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-14, "Making and Curing Concrete Compression and Flexure Test Specimens".

(g) 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 (2) companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-14, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two (2) 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.

(h) 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 E18.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) (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-14, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E17.6.6 Corrective Action

(a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

E17.7 Measurement and Payment

E17.7.1 Supplying and placing structural concrete will not be measured. This Work shall 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 performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(a) Items of Work:

(i) Supply and Place Structural Concrete:

¨ Abutments;

(b) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Supply and Place Structural Concrete”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E17.7.2 Concrete Heating and Hoarding

(a) Heating concrete and supplying, setting up, heating, and removing the hoarding will not be measured and will be paid for at the Contract Lump Sum Price for "Concrete Heating and Hoarding", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E18. SUPPLYING AND PLACING REINFORCING STEEL

E18.1 Description

E18.1.1 This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

E18.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E18.1.3 Scope of Work

(a) The Work under this Specification shall involve supplying and placing all steel reinforcing, as shown on the Drawings for the following Works:

SCOPE OF WORK	
Item	Type of Steel Reinforcing
Abutments	CSA-G30.18 Grade 400W

E18.2 References

E18.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) ASTM A955 /A955M-17a – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;

(b) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;

(c) CAN/CSA A23.1/A23.2-14 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(d) CAN/CSA G30.18-09 (R2014) – Billet Steel Bars for Concrete Reinforcement;

(e) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and,

(f) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E18.3 Submittals

E18.3.1 General

(a) At least twenty-one (21) Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its Operators shall be submitted to the Contract Administrator for review and approval.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to commencement of any schedule Work on the Site, a proposed schedule, including methods and sequence of operations.

(c) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on-site.

(d) Contractor to submit Shop Drawings (including bar lists) in accordance with section E4 and the latest edition of the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

E18.4 Materials

E18.4.1 General

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

(b) Bundles of reinforcing steel shall be identified by tags containing bar marks.

(c) The reinforcing steel shall not be placed directly on the ground. Sufficient timber pallets or blocking shall be placed under the reinforcing steel to keep them free from dirt and mud.

E18.4.2 Reinforcing Steel

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

(b) All reinforcing steel shall conform to the requirements of CSA-G30.18 Grade 400W for Concrete Reinforcement.

(c) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.

(d) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18-09 (R2014) and ASTM A955/A955M-17a.

E18.4.3 Bar Accessories

(a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.

(c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

(d) Placing of bar supports shall be done to meet the required construction loads.

(e) Tie wire shall be black, soft-annealed 1.6 mm diameter wire or Nylon coated wire for black steel reinforcing.

(f) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator in accordance with B8.

(g) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar

accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E18.4.4 Mechanical Splices

(a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, or Type 316L.

E18.5 Construction Methods

E18.5.1 Fabrication of Reinforcing Steel

E18.5.2 General

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

E18.5.3 Black Steel Reinforcing

(a) Heating shall not be used as an aid in bending black steel reinforcing.

(b) Hooks and bends should be smooth and not sharp.

(c) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.

E18.5.4 Placing of Reinforcing Steel

(a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.

(b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

(c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.

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

(e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used.

(f) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.

(g) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.

E18.6 Quality Control

E18.6.1 Inspection

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

reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification, regardless of any previous inspection or approval.

E18.6.2 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.

E18.6.3 Quality Control Testing

(a) Quality control testing may be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

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

E18.6.4 Measurement and Payment

(a) Reinforcing steel bars will be paid for on a unit basis and paid for at the Contract Unit Price for "Items of Work" listed below. The amount to be paid for will be on a mass basis and shall be paid for at the Contract Unit Price per kilogram in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E18.6.5 Items of Work:

(a) Supply and Delivery of Reinforcing Steel
  (i) Black Steel Reinforcing

(b) Placing Reinforcing Steel
  (i) Black Steel Reinforcing

(c) Supplying and installing all the listed materials, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Delivery of Reinforcing Steel" and "Placing Reinforcing Steel", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E19. SUPPLY, FABRICATION AND ERECTION OF MISCELLANEOUS METAL

E19.1 Description

E19.1.1 This specification shall cover all operations relating to the supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification.

E19.1.2 Miscellaneous metal includes, but is not limited to;

(a) Retaining angles and related assemblies, prefabricated and pre-set anchors, galvanized steel templates, anchor bolts, fasteners, washers and nuts, and anchor rods;

(b) Quality control of materials and fabrication, including magnetic particle testing of welds; and,

(c) Galvanizing of miscellaneous metal.

E19.1.3 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 other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E19.2 References and Related Specifications

(a) All related specifications shall be current issued or latest revision at the first date of Bid Opportunity advertisement.

E19.2.1 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) CSA W47.1, Certification of Companies for Fusion Welding of Steel;

(e) ASTM A36, Standard Specification for Carbon Structural Steel;

(f) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless;

(g) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;

(h) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products;

(i) ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications;

(j) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes;

(k) ASTM A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes;

(l) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service;

(m) ASTM A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use;

(n) ASTM A484, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings;

(o) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

(p) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding;

(q) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service;

(r) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered;

(s) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement;

(t) ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;

(u) ASTM A1064/A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete;

(v) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables;

(w) ASTM B29, Standard Specification for Refined Lead;

(x) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use;

(y) ASTM F3125/F3125M, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions;

(z) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay);

(aa) AWS D1.5M/D1.5, Bridge Welding Code;

(bb) AWS D1.1, Structural Welding Code – Steel; and,

(cc) AWS D1.6, Structural Welding Code – Stainless Steel.

E19.3 Scope of Work

(a) Supply and install galvanized retaining angles attached to the concrete abutments, timber backwalls, and timber wingwalls including all anchor bolts, screws, bolts, and washers.

(b) Supply and install ferrule anchors for the galvanized bearing retaining plate assemblies complete with galvanized anchor bolts, nuts and washers.

E19.4 Submittals

E19.4.1 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.

E19.5 Materials

E19.5.1 General

(a) 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.

E19.5.2 Miscellaneous Metals

(a) 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.

E19.5.3 Welded Steel Construction

(a) 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 and Addendum.

E19.5.4 Zinc

(a) Zinc for hot dipped, galvanized coatings shall conform to the requirements of ASTM A123.

E19.5.5 Stainless Steel

(a) Stainless steel bolts, nuts, washers, inserts, and the like as shown on the Drawings shall conform to the requirements of ASTM A320, Grade B8, Class 2.

(b) Stainless steel plates and perforated plates as shown on the Drawings shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirement for ASTM A240 and ASTM A666.

(c) Stainless steel shapes, such as angles, shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirements of ASTM A276

(d) Stainless steel pipe or tubing, not electrical conduit, shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirements of ASTM A312

E19.6 Construction Methods

E19.6.1 Fabrication

(a) General

(i) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(ii) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(iii) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.

(iv) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(v) Field high-tensile bolted connections shall have all holes drilled or sub-punched and reamed using steel templates. Templates shall be located with utmost care as to position and angle and firmly bolted in place.

(vi) Cutting shall be in accordance with AWS D1.1, D1.6 and CSA W59.

(b) Clean Material

(i) The material shall be clean, free from rust, mill scale, and other foreign matter before being worked in the shop. Material shall be cleaned by wheelabrating, sandblasting or other methods subject to the Contract Administrator's approval.

(c) Finish

(i) All portions of the Work shall be neatly finished. Shearing, cutting, chipping and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

(d) Bending

(i) When bending is necessary in order to meet the requirements of the design, it shall be done with care and by methods subject to the approval of the Contract Administrator. The bend line shall be at right angles to the direction of rolling. The internal radius of bend of load carrying sections shall not be less than twice the thickness of the bend section when bent cold, and if a smaller radius of bend is essential, the material shall be bent hot and later annealed. Before bending, the edges of the section in the region of the bend shall be smoothed and rounded to a radius of 2 mm.

(e) Holes

(i) General - Except where a specific method of holing materials is shown on the Drawings or required in the Specifications, all holes shall be either drilled or sub-punched and reamed with the exception of the holes and slots in the rectangular steel guardrail which may be punched. Poor matching holes will be cause for rejection.

(ii) Punched Holes and Slots - For holes and slots punched full size, the diameter or size of the die shall not exceed that of the punch by more than 2 mm. All holes and slots which are punched shall have burrs and sharp edges removed. All holes shall be clean-cut without torn of ragged edges. The punching shall not distort the structural member. If required by the Contract Administrator, a sample of the punching operation shall be carried out to the satisfaction of the Contract Administrator prior to the start of fabrication.

(iii) Drilled Holes - Drilling shall be done with twist drills or core drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.

(iv) Sub-Punched and Reamed Holes - All holes shall be sub-punched or sub-drilled to a diameter 5 mm smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.

(v) Allowable Tolerance for Holes - All matching holes for bolts shall register with each other so that a gauge 2 mm less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The centre-to-centre distance between any two (2) 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.

(f) Welding

(i) Specifications: Welding shall conform to the requirements of the Structural Welding Code - Steel of the American Welding Society AWS D1.1 and addendum and CSA W59 Welded Steel Construction. Welding of stainless

steel shall conform to the requirement of the American Welding Society AWS D1.6.

(ii) Welding Operator Qualification: Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. Qualification shall have been issued within two (2) years of commencement of fabrication. The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he will use and all pertinent data of the tests. Evidence that the welding operators have been executing satisfactory welding in the required processes within the six (6) month period immediately prior to commencement of fabrication shall also be provided to the Contract Administrator. The Contractor shall bear the whole cost and be fully responsible for the qualification of all welding operators.

(iii) Welding Procedures, Specifications and Qualification: Welding procedures that conform in all respects to the approved procedures of AWS D1.1, D1.6 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications. Welding procedures that do not conform to approved procedures in AWS D1.1, D1.6 and CSA W59 shall be qualified by tests carried out in accordance with AWS D1.1or D1.6. The Contract Administrator may accept previous qualifications of the welding procedure.

(iv) Welding Materials: All electrodes for manual shielded metal arc welding shall conform to the low hydrogen classification requirements of the latest edition of the American Welding Society's Filler Metal Specification AWS A5.1 or AWS A5.5 and the CAN/CSA W48 Specification and be capable of producing weld metal having an impact strength of at least 27 J (Charpy V-Notch) at -18^{o}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^{o}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.

(v) 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.

(vi) 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.

(vii) 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.

(viii) Electrodes conforming to AWS A5.1 shall be purchased and delivered in hermetically sealed containers or shall be dried for at least two (2) hours between 230^{o}C and 260^{o}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^{o}C + 15^{o}C before being used. All electrodes for use in welding ASTM A514/A517. steel having a

strength lower than that of the E100XX classification shall be dried for 1 hour + 15 min. at a temperature of 425ºC + 15ºC before being used.

(ix) Electrodes shall be dried prior to use if the hermetically sealed container shows evidence of damage. Immediately after removal from hermetically sealed containers or from drying ovens, electrodes shall be stored in ovens held at a temperature of at least 120ºC. E70XX electrodes that are not used within four (4) hours, E80XX within two (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.

(x) 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.

(xi) Flux from packages damaged in transit or handling shall be discarded or shall be dried before use at a minimum temperature of 120ºC for one (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.

(xii) Preheat and Interpass Temperature: The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1, D1.6 and CSA W59.

(xiii) Welding Processes: Welding processes which do not conform to the provisions of AWS D1.1, D1.6 or CSA W59 shall not be used without the written approval of the Contract Administrator.

(xiv) Distortion and Shrinkage Stresses: Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of 120ºC, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.1, D1.6 and CSA W59 shall be followed in the control of distortion and shrinkage stresses.

(xv) Tack Welding: All tack welds shall be a minimum of 10 mm in length and made with low hydrogen electrodes and shall not be incorporated in the final structure without specific written authorization by the Contract Administrator.

(xvi) Hot-Dip Galvanizing: Galvanizing, when called for on the Drawings, for items other than fasteners shall be done in accordance with ASTM A123. 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.

E19.6.2 Handling, Delivery and Storage of Materials

(a) Precautionary measures shall be taken to avoid damage to miscellaneous metal during handling, transit, stockpiling and erecting. Pinholes, or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of miscellaneous metal.

(b) Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

(c) 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.

E19.6.3 Erection

(a) Layout 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.

(b) Workmanship

(i) 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. Hammering which will injure or distort the member is not permitted.

(c) Misfits and Field Fitting

(i) 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.

(d) Field Welding

(i) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings, AWS D1.1 and CSA W59.

(e) Final Cleaning

(i) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E19.7 Quality Control / Quality Assurance

E19.7.1 Quality Control

(a) 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.

(b) 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. 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 twenty-four (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.

(ii) All defects revealed shall be repaired by the Contractor at his own expense and to the approval of the Contract Administrator.

E19.7.2 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.

E19.8 Measurement and Payment

E19.8.1 Supply, fabrication and erection of miscellaneous metal will be paid for on a unit basis and paid for at the Contract Unit Price for "Miscellaneous Metal". The amount to be paid for will be on a mass basis and shall be paid for at the Contract Unit Price per kilogram in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E20. ACROW PANEL BRIDGE

E20.1 Description

E20.1.1 The Contractor will be required under this Specification to supply, transport, assemble and erect the Acrow Panel Bridge.

E20.1.2 The Contractor will assemble and erect the Acrow Panel Bridge in conjunction with the Acrow Panel Bridging Technical Handbook (Acrow Handbook) and as detailed on the Drawings.

E20.2 Materials

E20.2.1 The Contractor will be required to supply new, galvanized components to construct 1 – 33.528 m. span 700XS Acrow Panel Bridge with a roadway width (curb-to-curb) of 5.0 m. and a clear width between trusses of 5.63m.

E20.2.2 The Bridge shall include steel stringers to accommodate a timber deck.

E20.2.3 The bridge shall be designed according to the CAN/CSA-S6-14 Canadian Highway Bridge Design Code including all interims for the CL 625 design live load or a John Deere 300D with full payload of approximately 27.3 tonnes or a CAT 740 with full payload of approximately 38 tonnes.

E20.2.4 The supply of the 700XS Acrow Panel Bridge shall include:

(a) All steel components from top of Steel Stringers to underside of Bearings for the in-place bridge,

(i) All launching components and equipment including rollers, required for the assembly and launching shall be supplied by the City. The contractor shall coordinate and pick up the equipment within 20 km from Winnipeg as directed by the Contract Administrator.

(b) All other Acrow Panel Bridge components including launching equipment for the final in-place bridge.

E20.3 Construction Methods

E20.3.1 The Contractors may view a copy of the Acrow Panel Bridging Technical Handbook (Acrow Handbook) at the office of:

(a) Dillon Consulting Limited, 1558 Willson Place, Winnipeg, Manitoba.

E20.3.2 The Contractor shall call for an appointment prior to viewing the handbook. Copies of selected pages from the handbook may be reproduced at the Contractor's expense. Questions during the bidding period regarding the Acrow Panel Bridge may be directed to Acrow's Chuck Hunter in British Columbia at (604) 276-5550 or Ken Scott in Toronto at (905) 857-2669.

E20.3.3 Acrow Bridge Representative

(a) The Contractor will be responsible for providing an Acrow Representative to assist with the planning, material assembly, launch design, launching, and erection of the Acrow Panel Bridge.

(b) The Contractor will pay Acrow Canada Limited directly for the costs associated with the services of the Acrow Representative. No additional payment will be made for the provision of the Acrow Representative and will be considered incidental to the Works.

(c) It is the Contractor's responsibility to coordinate construction activities with Acrow Canada Limited as related to the scheduling and provision of the Acrow Representative. The Contractor is responsible for arranging the services of the Acrow Representative, at least fourteen (14) days in advance, and providing notice to the Contract Administrator.

E20.3.4 Detailed Installation Procedure

(a) The Contractor shall submit a detailed installation procedure to the Contract Administrator for Approval at least fourteen (14) days prior to the scheduled installation of the Acrow Panel Bridge. Installation shall not commence without the Contract Administrator's approval of the installation procedure.

(b) The detailed installation procedure shall comply with the instructions and recommendations in the current Acrow Handbook and Acrow Panel Bridge drawings. The following items shall be addressed in the procedure, but not limited to as a minimum:

(i) Construction Scheduling

(ii) Contractor's site representative, manpower, and equipment

(iii) Site lay-out for storage, assembly, base plates/mudsills for roller locations, equipment and crane locations if applicable

(iv) Compaction of bearing soils, setting of alignment and elevations of base plates for roller locations

(v) Launch configuration for the launch nose and Acrow bridge to be placed

(vi) Method and details of launch including load application points

(vii) Applicable weights during launching or lifting

(viii) Jacking and/or final positioning of the Acrow bridge

(ix) Blocking for stability during setting and resetting of jacks

(c) The Contract Administrator's review of the installation procedure shall not relieve the Contractor of the responsibility for safety during the installation of the Acrow Panel Bridge.

E20.3.5 Erection of Acrow Panel Bridge

(a) Launching Nose

(i) The launching nose configuration and assembly shall be in accordance with the instructions in the Acrow Handbook.

(b) Handling and Assembly

(i) The Contractor shall handle the components so that no damage occurs. Any damage to the component(s) shall be repaired or replaced to the satisfaction of the Contract Administrator by the Contractor. The launching rollers shall be covered (tarped/sheltered) during delivery and storage to prevent deterioration.

(c) Site Preparation

(i) The Contractor shall prepare the site in conformance with:

Acrow Handbook

Contract Documents

(ii) The Contractor shall compact the bearing soils (backfill) to the required Specification and set the alignment and the required elevations of the base plates for the roller and launching bearings to ensure stability.

(d) Installation

(i) The Contractor shall supply all labour, temporary equipment, tools, and materials required for the installation of the bridge in a launch method from one side of the aqueduct in accordance with the manufacturer's recommendations. During the launch operations, the Contractor shall monitor and record each launch roller bearing for settlement or other problems.

(ii) No vehicular traffic shall utilize the bridge until the bridge is set onto the Acrow bearings.

(e) Roadway Approaches

(i) The Contractor shall be responsible for construction of the roadway approaches to facilitate the placement of the Acrow Panel Bridge.

E20.4 Measurement

E20.4.1 Supply, Assembly and Erection of Acrow Bridge

(a) The supply, loading, transportation, delivery, unloading, assembly and erection of the Acrow Bridge and all other materials, equipment, and components necessary to complete the Work will be paid for on a lump sum basis and no measurement will be made of this Work.

E20.5 Payment

E20.5.1 Supply, Assembly and Erection of Acrow Bridge

(a) The supply, loading, transportation, delivery, unloading, assembly and erection of the Acrow Bridge and all other materials, equipment and components necessary to complete the Work will be paid for at the Contract lump sum price for "Supply, Assembly and Erection of Acrow Bridge" which price shall be payment in full for performing all operations herein described and all other items incidental to the Work.

E21. SUPPLY AND INSTALL TIMBER DECKS, WINGWALLS, AND BACKWALLS

E21.1 The Contractor will be required to supply and install all timber and associated hardware in accordance with this Specification and the Drawings.

E21.2 Materials

E21.2.1 The timber shall be Coastal Douglas Fir #2, or better; structural full sawn and treated. All timber shall be inspected by a certified inspection company after treatment. The Contractor shall submit a copy of the inspection report to the Contract Administrator prior to shipment to the site. The cost of inspection and provision of the inspection report shall be considered as incidental to the Contract lump sum price for "Supply and Installation of Timber Deck, Wingwalls, and Backwalls".

E21.2.2 All timber shall be graded in accordance with N.L.G.A. standard grading rules for Canadian lumber or in accordance with Canadian Wood Council standard grading.

E21.2.3 Backwalls shall be constructed of glulam timber beams: EWS 24-V4 DF/DF or D.Fir.L. 24f-EX stress grade. Approved products include PERMAPOST K520^{TM} as supplied by: Matheus Lumber Co., Inc Woodinville, Wa. (Phone number: 800-284-7501).

E21.2.4 All treatment shall be in accordance with the latest edition of the CSA O80 Series 15 – Wood Preservative and the A.W.P.A. (American Wood Protection Association) Manual of Recommended Practices. All timber shall be pressure treated with ACZA.40 (ammoniacal copper zinc arsenate) after millwork is completed. The minimum net retention of preservative in the lumber shall be 6.4 kg/m^3.

E21.3 Construction Methods

E21.3.1 The bill of material for timber and associated hardware (fasteners) are shown on the Drawings. Included in the work associated with this Specification shall be the supply and installation of all Fasteners.

E21.3.2 The timber decking shall be planed on two (2) edges and one side and laid heart side down.

E21.3.3 Glulam timber beams to be installed as detailed on the Contract Drawings.

E21.4 Measurement

E21.4.1 Supply and installation of timber and all associated hardware (fasteners) required for the bridge deck and curbs will be paid for on a lump sum basis and no measurement will be made of this Work.

E21.5 Payment

E21.5.1 Supply and installation of timber will be paid for at the Contract lump sum price for "Supply and Installation of Timber Deck, Wingwalls, and Backwalls," which price shall be payment in full for performing all operations herein described and all other items incidental to the Work.

E22. SUPPLY AND INSTALLATION OF THRIE BEAM GUARDRAIL

E22.1 Description

E22.1.1 This Specification shall cover the supply and installation of the thrie beam guardrail.

E22.2 Materials

E22.2.1 The thrie beam guardrail and all incidental components shall be galvanized.

E22.2.2 Wood components for the thrie beam blocking as per Specification E21.

E22.3 Construction Methods

E22.3.1 The guardrail shall be erected on each side of the bridge, complete with terminal sections at the four ends. The guardrail shall be installed according to the manufacturer's directions and the Drawings. Included in the work associated with this Specification, shall be the supply and installation of all thrie beam guardrail components and fasteners.

E22.4 Measurement

E22.4.1 Supply and installation of thrie beam guardrail including blocking and all components and accessories will be paid for on a lump sum basis and no measurement will be made of this Work.

E22.5 Payment

E22.5.1 Supply and installation of thrie beam guardrail will be paid for at the Contract lump sum price for "Supply and Installation of Guard Rail and Accessories," which price shall be payment in full for performing all operations herein described and all other items incidental to the Work.

E23. SUPPLY AND INSTALL PRECAST CONCRETE BARRIERS

E23.1 The Supply and Install of Precast Concrete Barriers shall be supplied and installed in accordance with the Manitoba Infrastructure Specification 1080 (I): Fabrication and Delivery of Precast Concrete Barriers dated May 2010. A copy of the Manitoba Infrastructure Specification 1080 (I) is included in Appendix 'C' and found at http://www.gov.mb.ca/mit/contracts/manual.html. A copy of the details for the Precast Concrete Barriers is included in Appendix 'C' and found at http://www.gov.mb.ca/mit/wcs/standards.html.

E23.2 Notwithstanding to the Manitoba Infrastructure Specification 1080 (I): Fabrication and Delivery of Precast Concrete Barriers, the term "Engineer" shall be replaced by the term "Contract Administrator".

E23.3 Notwithstanding and in addition to the Manitoba Infrastructure Specification 1080 (I): Fabrication and Delivery of Precast Concrete Barriers, the following shall apply:

E23.3.1 The pre-cast concrete barriers shall be constructed and installed as shown on the Drawings,

E23.3.2 Eye bolts and other miscellaneous inserts shall be in accordance with CSA G40.21 grade 300 and shall be Hot-Dip galvanized in accordance with CAN/CSA G164.

E23.3.3 All metal surfaces to be galvanized shall be cleaned thoroughly of rust scale, mill scale, dirt, point 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.

E23.4 The Contractor shall supply and install reflectorized warning strips on each of the concrete barriers at a location as directed by the Contract Administrator. No additional payment will be made for the supply and installation of reflective warning strips.

(a) Approved reflective warning strips include product number LDSW346 as supplied by Guardian Traffic Services, Winnipeg Manitoba. The size of the strips is 837 mm (34") wide by 152 mm (6") tall.

E23.5 Measurement and Payment

E23.5.1 Supply and Installation of Pre-Cast Concrete Traffic Barriers will be measured on a Unit Basis. The total number of barriers to be paid will be the total number of barriers shown on the Drawings and accepted by the Contract Administrator.

E23.5.2 No additional payment will be made for the supply and installation of reflector strips as described in this Specification as this is considered incidental to "Supply and Install Pre-Cast Concrete Traffic Barriers".

E23.5.3 Supply and Installation of Pre-Cast Concrete Traffic Barriers will be paid for at the Contract Unit price for "Supply and Install Pre-Cast Concrete Traffic Barriers", measured as herein, and will be payment in full for performing all operations herein described and all other items incidental to the Work.

E24. ROADWAY SIGNS

E24.1 Description

E24.1.1 This Section specifies the requirements for supplying and installing permanent roadside signs on the all season road. The roadside signs herein described can be referenced from the Manitoba Infrastructure (MI) Signing Manual, hereinafter called the Manual. The copy of the Manual is attached in Appendix C.

E24.1.2 This Section also specifies the removal of existing roadway signs along the existing alignment and in some cases the re-installation of designated existing signs.

E24.2 Materials

E24.2.1 Sign Supports

(a) Timber Posts:

(i) Sawn Timber Posts:
Spruce or Jack Pine
Pressure treated
Number 2 Grade
Dimension: 100 x 100 mm
Length to suit

(b) Fasteners: bolts, nuts, washers and other hardware for roadside signs to be cast aluminum alloy, or galvanized steel.

E24.2.2 Signboards

Aluminum base sheet to CSA HA.4-6061-T6, pre-cut to required dimensions. Thickness to be a minimum of 1.6 mm for signboards up to 750 mm wide. Thickness to be 2.1 mm for signboards between 750 – 1200 mm wide. Aluminum to 5052-H38 grade.

(a) All traffic signs to conform strictly with the Manual. Reflective sheeting shall be:

(i) ASTM X1 3M diamond grade cubed sheeting for all regulatory (R-Series) signs.

(ii) ASTM X1 3M diamond grade cubed fluorescent sheeting for all warning (W-Series) signs.

(iii) All other signs to have ASTM Type IV (High Intensity Prismatic) sheeting.

(b) Reflective background sheeting, lettering and silk screened paints shall be applied in accordance with manufacturer's instructions.

(c) Degrease, etch and bonderize aluminum sheet with chemical conversion coating. Apply adhesive coated material by squeeze roll application method.

(d) Signs shall be pre-punched with appropriate holes for installation prior to clear coat application.

(e) Protect finished signboard faces with one (1) coat of clear coat.

(f) The list of roadway signs to be supplied and installed within the contract limits are as shown on the Drawings.

E24.3 Construction Methods

E24.3.1 Sign Support Installation

(a) Erect posts as described herein. Permissible tolerance is 50 mm maximum departure from vertical for direct buried supports. Erect posts plumb and square and as detailed on the Drawings.

E24.3.2 Wooden Post Installation:

(a) Excavate post holes to minimum 200 mm diameter and 900 mm depth. Compact bottom of hole to provide firm foundation. Set post and backfill in 150 mm layers with Limestone Base Course "A" material. Compact each layer before placing each subsequent layer.

E24.3.3 Signboard Installation

(a) Fasten signboard(s) to supporting posts and brackets as required to provide a minimum height above travel surface elevation as indicated in the manual.

E24.3.4 Correcting Defects

(a) Correct defects, identified by the Contract Administrator, in sign message, consistency of reflectivity, colour or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to the approval of the Contract Administrator.

E24.4 Measurement and Payment

E24.4.1 Supply and installation of roadway signs will be measured on a unit basis and paid for at the Contract Unit Price for "Supply and Installation of Roadway Signs", including excavation, sign supports, fasteners, signboards, backfilling and all items necessary for a complete unit. Supplementary signs to be installed on the same post are to be considered incidental

E25. EROSION CONTROL BLANKET (ECB)

E25.1 Description

E25.1.1 This Specification covers the supply, installation, and maintenance of erosion control blanket to be installed as shown on the Drawings and as directed by the Contract Administrator.

E25.2 Materials and Equipment

E25.2.1 Erosion Control Blanket (ECB)

(a) Erosion Control Blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut blanket with a functional longevity of up to twenty-four (24) months. Suitable products include SC 150 Extended Term manufactured by North American Green, or approved equivalent.

(b) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the topside with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 159 mm x 159 mm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 127 mm x 127 mm mesh. The blanket shall be sewn together on 381 mm centres (maximum) with degradable thread

(c) ECB shall have the following properties:

(i) Matrix 70% Straw Fibre (0.19 kg/m^2) and 30% Coconut Fibre (0.08 kg/ m^2).

(ii) Netting top side heavyweight photodegradable with UV additives (1.47 kg/100 m^2).

(iii) Bottom side lightweight photodegradable minimum netting weight (0.73 kg/100 m^2).

(iv) Degradable thread.

E25.3 Submittals

E25.3.1 The Contractor shall submit all manufacturers' product specifications and recommended installation methods for the proposed ECB and associated materials to the Contract Administrator a minimum of fourteen (14) days before construction.

E25.4 Construction Methods

E25.4.1 The Contractor shall supply all ECB materials required and store them on-site. The installation and maintenance of all ECB will be as directed by the Contract Administrator.

E25.4.2 Actual alignment and location of the ECB may be adjusted in the field by the Contract Administrator.

E25.4.3 Erosion Control Blanket – Drainage Channel Installation

(a) Excavation a trench 150 mm deep by 150 mm wide along the perimeter. Place the ECB such that 300 mm of the blanket overlaps the grouted stone rip rap. Anchor blanket with 200 mm long staples in the trench a maximum of 300 mm apart. Backfill trench with soil and compact. Apply seed according to CW 3520 and CW 3540 to compacted soil and fold remaining portion of the blanket over seeded soil and secure with 200 mm long staples a maximum of 300 mm apart. Securely fasten blanket

against soil surface with 200 mm long staples with a minimum of four (4) staples per m².

(b) Transverse joints and end seams in the ECB shall have a minimum overlap of 150 mm and secured with 200 mm staples a maximum of 300 mm apart.

E25.5 Maintenance

E25.5.1 The areas covered with ECB shall be regularly inspected especially after severe rainfall or storm events, to check for blanket separation or breakage.

E25.5.2 Any damaged or poorly performing areas as the result of storm events shall be replaced/repaired immediately. Re-grading of the slope by hand methods may be required in the event of rill or gully erosion.

E25.5.3 Should the Contract Administrator determine that the Contractor has not maintained the erosion control blankets properly or has damaged the blankets from construction activities resulting in sediment releases beyond the Work area; the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at his own cost. As a minimum, the Contractor shall remove all deltas and sediment deposited in drainage ways and re-grade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within five (5) Working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within five (5) Working Days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration Work to restore property outside of the designated Work area shall be at his own cost.

E25.6 Measurement and Payment

E25.6.1 Supplying and placing Erosion Control Blanket will be measured on a square metre basis. The area to be measured shall be the total number of square metres of Erosion Control Blanket supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the Drawing dimensions. This item of Work will be paid for at the Contract Unit Price per square metre for “Supply and Install Erosion Control Blanket” performed in accordance with this Specification and accepted by the Contract Administrator.

E26. SUPPLY AND INSTALLATION OF SILT FENCE BARRIER FOR ROADWORKS

E26.1 Description

E26.1.1 The Work shall consist of:

(a) The supply, delivery, installation, maintenance, and removal of silt fence barriers;

(b) Removal of accumulated sediment, as required.

E26.2 References and Related Specifications

E26.2.1 All reference standards and related specifications shall be the current issue or the latest revision at the first date of Bid Opportunity advertisement.

E26.2.2 References

(a) ASTM D3786/D3786M, Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm;

(b) Bursting Strength Tester Method;

(c) ASTM D4632/D4632M, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles;

(d) ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile;

(e) ASTM D4491/D4491M, Standard Test Methods for Water Permeability of Geotextiles by Permittivity; and,

(f) GR130: Environmental Protection Specifications.

E26.3 Submittals

E26.3.1 The Contractor shall submit the following to the Contract Administrator, in accordance with E4:

(a) All Manufacturers' product specifications and recommended installation methods for the proposed silt fence barrier and associated materials.

E26.4 Materials

E26.4.1 Fabric

(a) The silt fence barrier fabric shall be woven polyester/polypropylene geotextile fabric with the following material properties:

Property	Standard	Test Method
Grab Tensile Strength	330 N	ASTM D4632
Apparent Opening Size	850 microns max	ASTM D4751
Elongation	15% max	ASTM D4632
Mullen Burst Strength	1000 kPa	ASTM D3786
Flow rate	400 L/min/m^2	ASTM D4491
Permittivity	1/sec	ASTM D4491

E26.4.2 Posts

(a) The posts shall be of sufficient strength to meet silt fence barrier performance and maintenance requirements. The posts shall be a minimum of 1.2 metres in length with a maximum spacing of 2.5 metres between posts;

(b) Posts for silt fence barrier shall be one of the following:

(i) Untreated fir or pine, minimum 34 mm x 40 mm in size. One end of the post shall be pointed.

(ii) Steel having a "U", "T", "L" or other cross sectional shape that can resist failure by lateral loads. Steel posts shall have a minimum mass per length of 1.1 kg/m. One end of the steel posts shall be pointed and the other end shall be marked with high visibility tape or paint or shall be capped with an orange or red plastic safety cap which fits snugly over the steel post. If steel posts are selected the Contractor shall submit to the Contract Administrator for review a sample of the capped steel post prior to installation.

E26.4.3 Fasteners

(a) When wooden posts are used, nails or staples shall be used to fasten the silt fence barrier fabric to the posts in accordance with Manufacturer's recommendations.

(b) When steel posts are used, tie wire or locking plastic fasteners shall be used to fasten the silt fence barrier fabric to the steel posts, in accordance with the Manufacturer's recommendations. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

E26.5 Construction Methods

E26.5.1 Installation

(a) The Contractor shall install silt fence barriers as identified on the Drawings, in this Specification and as directed by the Contract Administrator.

(b) The silt fence barriers shall be installed prior to placement of embankment or once the ditches have been excavated to design.

(c) Posts shall be spaced a maximum of 2.5 m apart, and shall be driven vertically into the ground to a minimum depth of 600 mm.

(d) Actual alignment and location of the silt fence may be adjusted in the field by the Contract Administrator compared with the alignment and locations shown on the Drawings.

(e) The silt fence shall be installed in a curved configuration along contours as shown on the Drawings and accepted by the Contract Administrator. The maximum dimensions of the curves are shown on the Drawings.

(i) By Hand

- A trench measuring approximately 200 mm wide by 200 mm deep shall be excavated along the entire line of posts. The trench shall be on the side of the posts where grading work is to be conducted. The geotextile from the silt fence barrier shall extend into the trench a minimum of 300 mm. The trench shall be backfilled and tamped to existing grade so as to hold the base of the geotextile firmly in place.
- The silt fence toe fabric shall achieve consistent placement depth and compaction such that no water flow can pass beneath the fence nor scour soil material away from the toe area of the fence.
- The back-filled toe trench material shall be compacted by operating the wheel of a tractor or skid steer on each side of the silt fence a minimum of two (2) passes, or alternative method to achieve similar compaction as approved by the Contract Administrator.

(ii) By Machine

- The geotextile of the machine sliced silt fence shall be inserted by machine in a slit in the soil 200 mm to 300 mm deep. The slit shall be created such that a horizontal chisel point at the base of a soil slicing blade slightly disrupts soil upward as the blade slices through the soil. The geotextile shall be mechanically inserted directly behind the soil slicing blade in a simultaneous operation, achieving consistent placement and depth. No turning over (plowing) of soil is allowed for the slicing method. The soil shall be compacted immediately next to the silt fence fabric by operating the wheels of a tractor or skid steer on each side of the silt fence a minimum of two (2) times.

(f) The silt fence barrier shall be installed without sags and have an overlap of 450 mm wherever its length is extended.

(g) The completed silt fence barrier shall have a minimum height of 600 mm above the ground surface.

E26.5.2 Maintenance

(a) The Contractor shall maintain the silt fences until they are no longer necessary and are removed. Maintenance shall consist of all work necessary to keep the devices functioning effectively. The Contractor shall repair or correct plugged, torn, displaced, damaged, or non-functioning devices to the satisfaction of the Contract Administrator.

(b) All silt fence barriers shall be inspected immediately after any runoff event and at least daily during prolonged rainfall. All required repairs shall be made immediately.

(c) The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through or under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging and maintain a 450 mm overlap on seams.

(d) If the Contract Administrator determines that the Contractor has not maintained the silt fences properly or has damaged the devices from construction or sediment removal activities resulting in sediment releases beyond the Work area, the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at his own cost. This shall include but is not limited to the removal of all deltas and sediment deposited in drainage ways and re-grade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within two Working Days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within two (2) Working Days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities and obtaining applicable permits and authorizations prior to working in surface waters.

(e) The Contractor's restoration work to restore property outside of the designated work area shall be at his own cost.

(f) No re-measurement or payment will be made for those areas damaged and requiring re-installation or replacement of silt fence due to faulty installation of the silt fence or the Contractor’s construction or sediment removal activities. No silt fence shall be removed or reinstalled without prior written authorization from the Contract Administrator.

E26.5.3 Sediment Removal

(a) Accumulated sediment shall be removed in a manner that avoids escape to the downstream side of the barriers and avoids damage to them. Sediment shall be removed to the level of the grade existing at the time of barrier installation, or as necessary to restore the function of the device, and shall conform to the following:

(i) accumulated sediment shall be removed when it reaches a depth of 30% the height of the silt fence barrier;

(ii) accumulated sediment shall be removed as necessary to perform maintenance repairs;

(iii) accumulated sediment shall be removed immediately prior to the removal of the silt fence barrier.

(b) Sediment removal shall occur within twenty-four (24) hours of discovery or as soon as field conditions allow access and no sediment removal shall be performed without authorization from the Contract Administrator.

(c) Sediment removal shall consist of supplying all supervision, labour, materials, plant, and equipment necessary for excavating, disposing and other associated operations to remove accumulated sediment and restore the capacity of the silt fence. Sediment shall be removed to the original grade or as necessary to restore the function of the device as determined by the Contract Administrator.

(d) If sediment removal is not possible, and replacement of a portion of the silt fence is deemed necessary by the Contract Administrator, replacement of the silt fence will be at the Contract Unit Price. The silt fence to be replaced shall be removed and properly disposed of off-site. No silt fence removal or replacement shall be performed without authorization of the Contract Administrator. There shall be no claim by the Contractor for silt fence removal or reinstallation without prior written authorization from the Contract Administrator.

E26.5.4 Silt Fence Barrier Removal

(a) Silt fence barriers shall be removed when, in the opinion of the Contract Administrator, they are no longer required. Silt fence barriers shall be removed in a manner that:

(i) avoids entry of equipment, other than hand held equipment, to any water course; and

(ii) prevents release of sediment and debris to any water course.

(b) Areas disturbed by the installation and removal of the silt fence barrier shall be restored to the original grade or to the satisfaction of the Contract Administrator and

seeded in accordance with Specification 403: Supply and Placement of Seed on Roadway Embankments.

(c) As part of the final removal of the silt fence the Contractor shall spread any accumulated sediment to form a suitable surface for seeding or dispose of the sediment at a working disposal area acceptable to the Contract Administrator.

(d) There shall be no measurement or payment for sediment removal and disposal performed as part the final removal of the silt fence.

E26.6 Quality Control/Quality Assurance

E26.7 Measurement

E26.7.1 Silt Fence Barrier

(a) Supply and placement of silt fence barriers will be measured in linear metre based on the actual length from measurements made by the Contract Administrator.

E26.7.2 Sediment Removal During Construction

(a) Sediment removal during construction will be measured in linear metre based on the length of the silt fence where sediment is removed from measurements made by the Contract Administrator.

E26.8 Payment

E26.8.1 Silt Fence Barrier

(a) Supply and placement of silt fence barrier will be paid for at the Contract Unit Price for "Supply and Placement of Silt Fence Barrier", measured as specified herein, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

(b) 60% of the Contract Unit Price will be paid following supply and installation to the satisfaction of the Contract Administrator and the remaining 40% will be paid for maintenance and removal upon completion.

(c) Where, in the opinion of the Contract Administrator, damage to the silt fence barrier has not resulted from the Contractor's operation or from failure to provide maintenance and sediment removal as specified, repair of damage to silt fence barriers shall be paid for on the basis of a Change Order in accordance with the General Conditions.

(d) Seeding of all areas below and adjacent to the silt fence or seeding of any other existing grassed areas disturbed by the Contractor from sediment removal during construction or from final removal of the silt fence is considered incidental to the Work and no separate measurement or payment will be made.

E26.8.2 Sediment Removal During Construction

(a) Sediment removal during construction will be paid for at the Contract Unit Price for "Sediment Removal at Silt Fence Barriers During Construction", measured as specified herein, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

E27. SUPPLY AND PLACEMENT OF TEMPORARY DITCH CHECKS FOR ROADWORKS

E27.1 Description

E27.1.1 The Work shall consist of:

(a) The supply, installation, maintenance, and removal of all temporary ditch checks including associated connections, pins and erosion control blanket, to be installed as shown on the Drawings and described in this Specification;

(b) The removal and disposal of accumulated sediment from the temporary ditch checks to restore capacity; and,

(c) The supply and application of seeding on disturbed areas.

E27.2 References and Related Specifications

E27.2.1 All related specifications shall be the current issue or the latest revision at the first date of Bid Opportunity advertisement.

E27.2.2 Related Specifications

(a) CW 3520: Seeding

(b) Specification E25: Supply and Placement of Erosion Control Blanket

(c) Supplemental Condition D15: Environmental Protection Plan

E27.3 Submittals

E27.3.1 The Contractor shall submit the following to the Contract Administrator:

(a) All Manufacturer's product specifications and recommended installation methods for the proposed temporary ditch checks and associated materials.

E27.4 Materials

E27.4.1 Type 1 – Permeable Sediment Ditch Check

(a) The permeable sediment ditch check shall be the triangular panel type (example: Georidge manufactured by Nilex), or the double panel type (example: Enviroberm manufactured by Cascade Geotechnical) and all associated connectors and pins, or approved equivalent.

E27.4.2 Type 2 – Straw Roll Ditch Check

(a) The straw roll shall consist of straw or wood fibre that has been compressed and stuffed into a biodegradable polyester or plastic netting. The straw or wood fibre roll shall be a minimum of 305 mm in diameter.

(b) Erosion control blanket Class 1, Type B in accordance with Specification E25 shall be placed beneath the ditch check.

(c) The straw roll shall be anchored with wooden stakes having a 50 mm x 50 mm cross section and a minimum length of 600 mm. Stakes shall have a maximum spacing along the roll of 1200 mm.

E27.4.3 Type 3 – Wood Slash Bundle Ditch Check

(a) Wood Slash Material

(i) The wood slash material shall be produced from locally available trees, branches and brush cleared from designated area by mechanical or manual means and processed further by wood chippers or similar grinding/mulching equipment.

(ii) The wood slash fibre shall be clean chips and long fibre strands, free from silts, sand, clay, snow, ice or any other material that would detract from the drainage and filtration characteristics.

(iii) Individual wood chips shall be nominally 25 mm to 150 mm in length and less than 37 mm thick on the narrow section. Flat or round elongated particle shapes are ideal.

(iv) Partially decomposed material affected by mold or mildew shall not be included in the wood slash material stock pile.

(b) Wood Whips and Small Diameter Logs

(i) Long fibre strands may be include flexible understory vegetation such as local willow, alder, white spruce and aspen saplings or similar slender branches and materials suitable of forming tightly packed bundles with limited voids within the core.

(ii) Longer wood strands or “whips” will be used as bundle containment materials to encase the smaller filter media.

(iii) Small diameter logs up to 75 mm calibre will be used to provide longitudinal strength and continuity to the exterior of the wood slash bundle.

(c) Wood Stakes

(i) Wood stakes shall be 50 mm x 50 mm x 600 mm to 1200 mm long (length to suit soil conditions) dimension lumber or similar wood pegs capable of being driven into the soils near and beneath the wood slash bundle to provide sufficient bundle binding, lateral stability against runoff flows and hold the bundle in close contact with the foundation soils.

E27.5 Construction Methods

E27.5.1 General

(a) The temporary ditch checks shall be installed immediately following removal of the existing vegetation within the existing ditches, or immediately following excavation and seeding of new ditches.

(b) The Contractor shall supply, install and maintain all temporary ditch checks as shown on the Drawings and as accepted by the Contract Administrator.

(c) The alignment and location of the temporary ditch checks shown on the Drawings may be adjusted in the field by the Contract Administrator.

E27.5.2 Type 1 – Permeable Sediment Ditch Check

(a) Installation of the straw roll ditch checks shall conform to the Manufacturer’s recommendations and as accepted by the Contract Administrator.

E27.5.3 Type 2 – Straw Roll Ditch Check

(a) Installation of the straw roll ditch checks shall conform to the Manufacturer’s recommendations and as accepted by the Contract Administrator.

(b) The straw roll shall be anchored (through the netting only) with wooden stakes on the downstream side of the roll with a maximum stake spacing of 1200 mm.

(c) Class 1, Type B erosion control blanket shall be installed under the straw roll ditch check to the dimensions shown on the Detail Drawings and in accordance with Specification 603: Supply and Placement of Erosion Control Blanket, Section 5.0 Construction Methods.

E27.5.4 Type 3 – Wood Slash Bundle Ditch Check

(a) The wood slash bundle ditch check core shall be comprised of wood slash material placed on the ground surface, encased on top with longer wood whips and poles.

(b) The wood slash bundle ditch check shall be nominally 0.5 m high, with base width 1 m and shaped as a rounded windrow. The length shall be as required to run continuously from high ground (bank to bank) through visible swales or concentrated runoff paths and terminating on high terrain on the opposite bank. The top of the bundle low point shall be 50 to 100 mm lower than the bottom of the flanking end to prevent runoff from eroding around the end of the wood bundle.

(c) The bundle shall be compressed together and tied down with twine to stakes or pegs driven into the ground at an angle near the base of the bundle, to provide sufficient bundle binding and lateral stability against runoff flows. The bundle shall be in close contact with the foundation soils to provide maximum filtration without washing away foundation soils.

(d) Sufficient shaping and compression shall be done to produce a neat roll surface conforming to the shape and dimensions shown on the Drawings.

E27.5.5 Maintenance

(a) The Contractor shall maintain the temporary ditch checks until they are no longer necessary Maintenance consists of keeping the devices functioning effectively. The Contractor shall repair or correct plugged, displaced, damaged, or non-functioning devices to the satisfaction of the Contract Administrator.

(b) Any damaged or poorly performing temporary ditch checks as a result of storm events shall be replaced/repaired immediately. Re-grading of the slope by hand methods may be required in the event of rill or gully erosion. Damaged areas may also require reseeding.

(c) Should the Contract Administrator determine that the Contractor has not maintained the temporary ditch checks properly or has damaged the devices from construction activities resulting in sediment releases beyond the Work area the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at his own cost. As a minimum, the Contractor shall remove all deltas and sediment deposited in drainage ways and re-grade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within five (5) Working Days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within five (5) Working Days of obtaining access.

(d) The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration work to restore property outside of the designated work area shall be at his own cost.

E27.5.6 Final Removal of Temporary Ditch Checks

(a) Type 1 temporary ditch checks will be removed as directed by the Contract Administrator;

(b) Type 2 temporary ditch checks are biodegradable and shall remain in place; and,

(c) Type 3 temporary ditch checks are biodegradable and shall remain in place.

E27.6 Measurement

E27.6.1 Type 1 - Permeable Sediment Ditch Check

(a) Supply and placement of permeable sediment ditch checks will be measured on a lineal metre basis.

E27.6.2 Type 2 – Straw Roll Ditch Check

(a) Supply and placement of straw roll ditch checks will be measured on a lineal metre basis.

E27.6.3 Type 3 – Wood Slash Bundle Ditch Check

(a) Wood Slash Material

(i) The production and stockpile of wood slash materials, specified herein is considered to be included in the cost for supply, placement and maintenance of wood slash bundle ditch checks and no additional measurement will be made.

(b) Wood Slash Bundles

(i) The supply, placement and maintenance of wood slash bundle ditch checks and related work shall be measured on a length basis.

E27.6.4 Erosion Control Blanket

(a) No measurement will be made for erosion control blanket under temporary ditch checks as it is incidental to the supply and placement of the ditch check.

E27.6.5 Damaged Ditch Checks

(a) Ditch checks requiring replacement as directed by the Contract Administrator will be re-measured and paid for at the Contract Unit Price specified herein.

(b) No re-measurement or payment will be made for those areas damaged and requiring reseeding or reinstallation due to faulty installation by the Contractor of the erosion control blanket and/or the temporary ditch checks or from the Contractor's construction activity.

E27.7 Payment

E27.7.1 Type 1 – Permeable Sediment Ditch Checks

(a) Supply and placement of permeable sediment ditch checks will be paid for at the Contract Unit Price for "Supply and Placement of Permeable Sediment Ditch Check", measured as specified herein, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

E27.7.2 Type 2 – Straw Roll Sediment Ditch Check

(a) Supply and placement of straw roll sediment ditch checks will be paid for at the Contract Unit Price for "Supply and Placement of Straw Roll Ditch Check", measured as specified herein, which will be payment in full for performing all operations herein described and all other items incidental to the Work.

E27.7.3 Type 3 – Wood Slash Bundle Ditch Check

(a) Wood Slash Material

(i) The production and stockpile of wood slash materials, specified herein is considered to be included in the cost for supply, placement and maintenance of wood slash bundle ditch checks and no additional payment will be made.

(b) Wood Slash Bundles

(i) The supply, placement and maintenance of wood slash bundles and related work as specified herein shall be paid for at the Contract Unit Price for "Supply and Placement of Wood Slash Bundle Ditch Check". The length to be paid for will be measured in meters of wood slash bundle placed in locations indicated on drawings and as directed by the Contract Administrator.

(ii) The supply and placement of binding twine and longer whips and wood pole material used for encasing wood slash bundles and foundation surface preparations are incidental to assembly and placement of Wood Slash Bundles and no separate measurement or payment will be made.

E28. GEOTEXTILE OVERLAPS AND SEWN SEAMS

E28.1 Description

E28.1.1 Further to CW 3130 Supply and Installation of Geotextile Fabrics the following shall apply:

E28.2 Submittals

E28.2.1 The Contractor shall submit the following to the Contract Administrator, in accordance with the Specification E4 Shop Drawings:

(a) Proposed seam stitch geometry and sewing equipment to be used for the sewn geotextile seams.

(b) A material specification sheet for the sewing thread to be used shall be submitted for review fourteen (14) days in advance of construction.

E28.3 Material

E28.3.1 Sewing thread shall be high strength (minimum 110 N) polyester for medium to heavy-duty geotextiles.

E28.4 Geotextile Joints

E28.4.1 On very soft subgrades (CBR<1) the fabric layout and aggregate placement should begin on firm soil at the site perimeter, to establish an "anchor point".

E28.4.2 The Contractor shall either sew or overlap the geotextile joints in accordance with the following table:

Subgrade CBR Value	Minimum Overlap
< 1 (i.e. peat)	Sewn seam required
> 1 to 4	900 mm
> 4	600 mm

E28.5 Geotextile Sewn Seams

E28.5.1 Geotextile seams shall be sewn at a rate of three (3) to six (6) stitches per 2.5 cm.

E28.5.2 The stitch type shall be Type 401 double thread 'lock stitch', or acceptable alternative, to achieve a minimum seam strength of 53 kN/m.

E28.5.3 The seam type shall be a "J" or "Butterfly" seam, or acceptable alternative, to achieve a minimum seam strength of 53 kN/m.

E28.5.4 Sewing equipment must be able to fabricate the required stitch geometry with the proper thread type.

E28.6 Measurement and Payment

E28.6.1 Connection of geotextile joints by sewn seam method and overlap less than 600 mm shall be considered incidental to the pay item "Separation / Reinforcement Geotextile Fabric".

E29. WORK ON AND AROUND THE AQUEDUCT

E29.1 At no time shall there be any equipment, activity, or traffic on top of the aqueduct.

E29.2 No heavy equipment or traffic shall be allowed within 12 metres from the centre line of the aqueduct.

E29.3 The Contractor shall be responsible to safeguard the aqueduct at all time during the construction.

E29.4 The Contractor shall monitor the vibration at the aqueduct to ensure the vibration limit of 6 mm/second is not exceeded.

E29.5 The Contractor shall contact the Contract Administrator and the City of Winnipeg immediately if damage occurs to the aqueduct.

E29.6 Any damage occurred to the aqueduct from the construction activities or from the Contractor's errors and omissions in the construction shall be repaired to the satisfactory of the Contract Administrator and to the City of Winnipeg and shall be paid for by the Contractor.

E29.7 No payment shall be made for the work on and around the aqueduct.

E30. USE OF AND WORK ON OR NEAR GREATER WINNIPEG WATER DISTRICT (GWWD)

E30.1 General

E30.1.1 The City of Winnipeg owns and operates the GWWD Railway between the Railway Yard in St. Bonifice (598 Plinquet Street) and the Intake at Shoal Lake. Work trains routinely deliver chlorine and other supplies to the Intake and materials for track upgrading and maintenance. Two (2) diesel locomotives are available along with an assortment of rolling stock. .

E30.1.2 The GWWD Railway is available to the Contractor to transport equipment and material to the work area if no other reasonable transportation options are available.

E30.1.3 GWWD Railway shall not be used to transport the Contractor's personnel unless prior approval of the City and the Contract Administrator.

E30.1.4 The GWWD Railway assumes no risk for the transportation of these goods and the Contractor must provide evidence of insurance as per D10.2(b) and D10.2(c) and a signed Waiver as per D10.2(d) if they wish to utilize the GWWD.

E30.1.5 Non City of Winnipeg personnel will be required to sign the GWWD Railway Waiver Form included in Appendix B prior to GWWD Railway use.

E30.1.6 The Contractor will have limited use of the GWWD Railway facilities as the priority of the Railway use will be given to the City's tasks.

E30.1.7 The Contractor shall develop a schedule outlining all required GWWD Railway activities and resources and the associated timetable prior to the commencement of construction. The City requires this schedule to deploy the necessary level of railway resources to the project in a timely manner and to schedule the Contractor's requirements with routine track usage.

E30.1.8 The Contractor may request additional use of the GWWD Railway for transporting equipment and material. The request shall be made seven (7) days prior to the scheduled use. The approval will be pending on the availability of the crew and the train.

E30.1.9 Operational requirements will take precedence over material and equipment deliveries. Neither the City nor the Contract Administrator shall be held liable for failing to provide rail transportation in any event.

E30.1.10 The Contractor shall ensure that all equipment, vehicles, personnel, and materials are kept at a minimum 3.5 m away from the nearest railway track, unless instructed otherwise by the Contract Administrator. The Contractor shall provide all labour and equipment necessary for loading and unloading equipment and materials including all equipment necessary to tie down loads.

E30.1.11 The Contractor shall coordinate with the City of Winnipeg when working on or near the GWWDR.

E30.1.12 When the service train is scheduled on the GWWDR, the construction work on and near the GWWDR shall cease until the City has indicated that it is safe so to proceed with the operations.

E30.1.13 The Contractor shall contact the Contract Administrator and the City of Winnipeg immediately if damage occurs to the GWWDR line.

E30.1.14 Any damage occurred to the GWWDR line from the construction activities or from the Contractor's errors and omissions in the construction shall be repaired to the satisfaction of the Contract Administrator and to the City of Winnipeg and shall be paid for by the Contractor.

E30.2 Train Service

E30.2.1 Rolling Stock that are available for use:

(a) Flat Bed Cars number available = 5

Deck width = 2.44 metres

Deck length = 16.9 metres

Maximum load capacity = 55,000 kilograms

(b) Ramp Cars number available = 1

Deck length = 16 metres

Maximum load capacity = 55,000 kilograms

(c) Cabooses number available = 1

(d) Site Dump Cars number available = 2

Maximum capacity 20 to 30 cubic metres

E30.2.2 The GWWD Railway right-of-way has sufficient horizontal clearances to transport loads up to 3.66 metre wide.

E30.3 No payment shall be made for use of and work on or near the GWWDR line.

PART F - SECURITY CLEARANCE

F1. SECURITY CLEARANCE

F1.1 Each individual proposed to perform Work under the Contract shall be required to obtain a Criminal Record Search Certificate from the police service having jurisdiction at his place of residence and Public Safety Verification Checks.

(a) Any cost or expense incurred by the Proponent that is associated with obtaining the required security clearances shall be borne solely by the Proponent.

F1.2 A Criminal Record Search Certificates can be obtained from one of the followings;

(a) police service having jurisdiction at his/her place of residence; or

(b) BackCheck, as described in F1.4; or

(c) http://www.winnipeg.ca/police/pr/pic.stm

(d) Commissionaires (Manitoba Division), forms to be completed can be found on the website at: http://www.commissionaires.ca/en/manitoba/home .

F1.3 Public Safety Verification Checks may be obtained from BackCheck as described in F1.4.

F1.4 To use BackCheck for obtaining security clearance, a company must be registered as a City of Winnipeg vendor, which can be arranged as follows:

(a) The Contractor can set up an account with BackCheck under their company name by completing the form at http://www.backlcheck.net/cityofwinnipeg/. A primary contact person for the company is required, who will receive within 48 hours account information and instructions for requesting checks through BackCheck.

(b) With the account information and instruction provided, the Contractor can begin requesting for a Criminal Record Check and/or Public Safety Verification for individuals.

(c) Each individual must provide the necessary information to complete a security check request. BackCheck will have results available for the City of Winnipeg and the company within 24 hours of submission.

(d) Additional assistance to obtain security clearance through BackCheck can be directed to Linda Ferens, (204) 999-0912 or lferens@backcheck.net.

F1.5 The original Criminal Record Search Certificate (Form P–253) will be provided by the Winnipeg Police Service to the individual applicant. The original has a validation sticker from the Winnipeg Police Service in the top right hand corner. The applicant shall:

(a) Provide the original Criminal Record Search Certificate (Form P–253) to the Contract Administrator, unless clearances are obtained through BackCheck as described in F1.4

F1.6 Prior to the commencement of any Work, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Contractor shall supply the Contract Administrator with a Criminal Record Search Certificate obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform the Work.

F1.7 Any individual for whom a Criminal Record Search Certificate is not provided, or for whom a Criminal Record Search Certificate indicates any convictions or pending charges related to property offences or crimes against another person will not be permitted to perform any Work.

F1.8 Any Criminal Record Search Certificate obtained thereby will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.

F1.9 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated criminal records search. Any individual who fails to provide a satisfactory Criminal Record Search Certificate as a result of a repeated criminal records search will not be permitted to continue to perform any Work.