
# THE CITY OF WINNIPEG

# TENDER

**TENDER NO. 822-2020**

**BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE**

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# PART B - BIDDING PROCEDURES

## B1. CONTRACT TITLE

B1.1 BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE

## B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 22, 2021.

B2.2 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 Contract Administrator or an authorized representative will be available at the Site at 13:00 on Wednesday, January 6, 2021 to provide Bidders access to the Site.

B3.2 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

## B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D5.1.

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

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

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

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

B4.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

## B5. CONFIDENTIALITY

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

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

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

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

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

## B6. ADDENDA

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

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

B6.3 Addenda will be available on the MERX website at www.merx.com.

B6.4 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B6.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B6.6 Notwithstanding B4, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D5.

## B7. SUBSTITUTES

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

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

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

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

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

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

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

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

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

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

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

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

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

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B18.

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

## B8. BID COMPONENTS

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

(a) Form A: Bid/Proposal;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond.

B8.2 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.

B8.3 The Bid shall be submitted electronically through MERX at www.merx.com.

B8.3.1 Bids will **only** be accepted electronically through MERX.

B8.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

## B9. BID

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

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

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

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

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

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

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

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

B9.4 Paragraph 13 of Form A: Bid/Proposal 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;

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

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

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

## B10. PRICES

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

B10.1.1 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.

B10.1.2 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D38. Any such costs shall be determined in accordance with D38.

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

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

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

B10.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B10.5.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

## B11. DISCLOSURE

B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B11.2 The Persons are:

(a) N/A

## B12. CONFLICT OF INTEREST AND GOOD FAITH

B12.1 Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.

B12.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

(i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or

(ii) compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;

(e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of its participation in the Tender process or the Work; or

(f) has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

B12.3 In connection with its Bid, each entity identified in B12.2 shall:

(a) avoid any perceived, potential or actual Conflict of Interest in relation to the procurement process and the Work;

(b) upon discovering any perceived, potential or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and

(c) provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.

B12.4 Without limiting B12.3, the City may, in its sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in its sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in its sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B12.5 Without limiting B12.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in its sole discretion:

(a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of its employees proposed for the Work;

(b) require the removal or replacement of any employees proposed for the Work that has a perceived, actual or potential Conflict of Interest that the City, in its sole discretion, determines cannot be avoided or mitigated;

(c) disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B12.4 to avoid or mitigate a Conflict of Interest; and

(d) disqualify a Bidder if the Bidder, or one of its employees proposed for the Work, has a perceived, potential or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.

B12.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

## 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 https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

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™) in the form of:

(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 include in its Bid Submission bid security in the form of a digital 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 Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf.

B14.2 Bid security shall be submitted in a digital format meeting the following criteria:

(a) The version submitted by the Bidder must have valid digital signatures and seals;

(b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B14.2(a).

B14.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B18.1(a).

B14.4 Bonds passing the verification process will be treated as original and authentic.

B14.4.1 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.

B14.5 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B14.6 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 Tender.

## B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 Bids will not be opened publicly.

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 MERX website at www.merx.com.

B15.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

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).

B15.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

## 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/Proposal.

B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly formed and the contract securities have been 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/Proposal.

## B17. WITHDRAWAL OF BIDS

B17.1 A Bidder may withdraw his/her Bid without penalty at any time prior to the Submission Deadline.

## 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 Tender, 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 B7.

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 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 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

## 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 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 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D38 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B19.4 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B18.

B19.4.1 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 2020-01-31) 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 Tender 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. FORM OF CONTRACT DOCUMENTS

D2.1 Notwithstanding C4.1(c) and C4.4, the Contract Documents will be provided to the Contractor electronically and there will be no requirement for execution and return to the City by the Contractor. Accordingly, the provisions under C4.4(a) and C4.4(b) are no longer applicable.

### D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of removal and replacement of the existing aerial supported Baltimore force main

D3.2 The major components of the Work are as follows:

(a) Mobilizing to Site;

(b) Removing birds nests and plugging potential nesting locations on the St. Vital Bridge;

(c) Installing temporary work platforms/demolition catch platforms;

(d) Removing the existing Baltimore aerial force main pipe and associated appurtenances crossing the St. Vital Bridge;

(e) Constructing expanded concrete supports at Pier Nos. 2, 5, and 7 to support the new aerial force main pipe;

(f) Supplying and installing the structural support assembly for the new aerial force main pipe;

(g) Supplying and installing new steel pipe support bearings;

(h) Coordinating delivery and installing the new aerial force main pipe;

(i) Supplying and installing riverbank connection piping;

(j) Supplying and installing electrical and controls;

(k) Tying the new force main into the existing system;

(l) Commissioning the new force main;

(m) Decommissioning and removing the existing temporary by-pass system;

(n) Restoring the Site; and

(o) Demobilizing from Site.

### D4. DEFINITIONS

D4.1 When used in this Tender:

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

(b) ”**Anvil**” means materials supplied by Anvil International, LLC, a company providing engineered pipes, valves, fittings, and supports;

(c) **“ANSI**” means American National Standards Institute;

(d) ”**ASME**” means American Society of Mechanical Engineers;

(e) "**AWWA**" means the American Water Works Association that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(f) "**CGSB**" means the Canadian General Standards Board that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

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

(h) "**HDPE**" means High Density Polyethylene;

(i) **"ISA**" means Instrumentation Society of America;

(j) "**PLC**" means Programmable Logic Controller;

(k) "**RTU**" means Remote Terminal Unit; and

(l) **SCADA**" means Supervisory Control and Data Acquisition.

## D5. CONTRACT ADMINISTRATOR

D5.1 The Contract Administrator is Tetra Tech Canada Inc., represented by:

Kimberly Yathon, B.Sc.
Manager of Projects

Telephone No. 204 227.1792
Email Address kimberly.yathon@tetratech.com

D5.2 At the pre-construction meeting, Kimberly Yathon will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

## D6. CONTRACTOR'S SUPERVISOR

D6.1 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.

## D7. NOTICES

D7.1 Except as provided for in C22.4, 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/Proposal.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D5.

D7.3 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:

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

Facsimile No.: 204 947-9155

## D8. FURNISHING OF DOCUMENTS

D8.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF formal only.

## SUBMISSIONS

## D9. AUTHORITY TO CARRY ON BUSINESS

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

## D10. SAFE WORK PLAN

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

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

D10.3 Notwithstanding 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.

## D11. INSURANCE

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

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

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

(c) an all risks course of construction insurance, including testing and commissioning, in the amount of 100% of the total contract price, written in the name of the Contractor and The City of Winnipeg to remain in place at all times during the performance of the work and until the date of substantial completion.

(d) All risks property insurance policy for all equipment and tools that may be owned, rented, leased or borrowed and used in conjunction with the Work.

(e) Contractors Pollution Liability insurance in the amount of at least $1,000,000 per occurrence and $1,000,000 aggregate insuring against claims for

(i) Bodily Injury;

(ii) Property Damage including diminution in value, and Natural Resource Damages;

(iii) Clean-Up;

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

(v) Sudden and gradual pollution conditions including the further disruption of pre-existing conditions from the services rendered by the Contractor.

D11.2 The Contractor shall ensure that any sub-contractors hired in connection with the work provide comparable insurances to that as outlined above in sections D11.1 (a) , (b) and section (d) , if required.

D11.3 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11.4 Deductibles shall be borne by the Contractor.

D11.5 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, as applicable.

D11.6 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

## D12. CONTRACT SECURITY

D12.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond 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; and

(b) a labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H2: Labour and Material Payment Bond), in an amount equal to fifty percent (50%) of the Contract Price.

D12.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

(a) the version submitted by the Contractor must have valid digital signatures and seals;

(b) the version submitted by the Contractor must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) the version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) the verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D12.1(b).

D12.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in its discretion, exercised reasonably, allows.

D12.1.3 Digital bonds passing the verification process will be treated as original and authentic.

D12.2 The Contractor shall provide the City Solicitor with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter 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 Documents, if applicable.

D12.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) give the Subcontractor written notice of the existence of the labour and material payment bond in D12.1(b); and

(b) post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

## D13. SUBCONTRACTOR LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract Documents, if applicable.

## D14. EQUIPMENT LIST

D14.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

## D15. DETAILED WORK SCHEDULE

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

D15.2 The detailed work schedule shall consist of the following:

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

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

(c) a daily manpower schedule for the Work;

all acceptable to the Contract Administrator.

D15.3 Further to D15.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path.

D15.4 Further to D15.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

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

D15.6 Further to D15.2(b), the Gantt chart shall be tracked and submitted bi-weekly, to be viewed and discussed at the construction meetings.

## SCHEDULE OF WORK

### D16. COMMENCEMENT

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

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

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

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

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

(iii) the Safe Work Plan specified in D10;

(iv) evidence of the insurance specified in D11;

(v) the contract security specified in D12;

(vi) the Subcontractor list specified in D13;

(vii) the Equipment list specified in D14; and

(viii) the Detailed Work Schedule specified in D15.

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

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

D16.3 The Contractor shall not commence the Work on the Site before March 15, 2021.

D16.4 The City intends to award this Contract by March 12, 2021

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

### D17. CRITICAL STAGES

D17.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Removal of existing birds nests and protection to prevent spring nesting within the area of Work by March 31, 2021.

(b) Commissioning and full operation of the new Baltimore force main system by November 15, 2021

D17.2 When the Contractor considers the Work associated with the critical stage to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D17.3 The date on which the critical stage work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of critical stage has been achieved.

### D18. SUBSTANTIAL PERFORMANCE

D18.1 The Contractor shall achieve Substantial Performance by November 30, 2021.

D18.2 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.

D18.3 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.

## D19. TOTAL PERFORMANCE

D19.1 The Contractor shall achieve Total Performance by December 15, 2021.

D19.2 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.

D19.3 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.

## D20. LIQUIDATED DAMAGES

D20.1 If the Contractor fails to achieve, Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Commissioning and full operation of the new Baltimore force main system - Two Thousand dollars ($2,000.00);

(b) Substantial Performance - Two Thousand dollars ($2,000.00);

(c) Total Performance - Five Hundred dollars ($500.00).

D20.2 The amounts specified for liquidated damages in D20.1 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.

D20.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

## D21. COVID-19 SCHEDULE DELAYS

D21.1 The City acknowledges that the schedule for this Contract may be impacted by the COVID-19 pandemic. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the health and safety of workers and the public, directives from health authorities and various levels of government and in close consultation with the Contract Administrator.

D21.2 If the Contractor is delayed in the performance of the Work by reason of the COVID-19 pandemic, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D21.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether COVID-19 will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to COVID-19, including but not limited to evidence related to availability of staff, availability of Material or work by others.

D21.4 For any delay related to COVID-19 and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D21.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D21.5 The Work schedule, including the durations identified in D17 to D19 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D21.6 Where Work not previously identified is being carried over solely as a result of delays related to COVID-19, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to COVID-19, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D21.7 Any time or cost implications as a result of COVID-19 and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

## D22. RESTRICTED WORK HOURS

D22.1 All Work shall be carried out between the hours of 07:00 and 22:00 Monday to Friday and between 09:00 and 21:00 on Saturday, Sundays, Civic, or Public Holidays.

D22.2 No Work shall be performed outside of the hours stated in D22.1 without written permission from the Contract Administrator. Approval will only be granted if it is in the best interests of the City to do so.

D22.3 Further to Clause 3.10 of CW 1130, “Site Requirements”, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed outside of the hours outlined in D22.1.

## CONTROL OF WORK

## D23. JOB MEETINGS

D23.1 Regular biweekly 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.

D23.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

## D24. WORK BY OTHERS

D24.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) Supply and Delivery of Force Main Pipe: Bid Opportunity 799-2020 – coordination with City and supplier of force main pipe to be replaced.

## D25. COOPERATION WITH OTHERS

D25.1 The Contractor’s attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working on the structure, approach roadways, adjacent roadways or rights-of-way. The activities of these agencies may coincide with the Contractor’s execution of the Work, and it will be the Contractor’s responsibility to cooperate to the fullest

extent with the other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of the Contract.

## D26. AUTHORIZED WORK ON PRIVATE PROPERTY

D26.1 The Contractor shall confine his Works to the right-of-way or easements as much as possible. Where Work is required to be done on or accessed through private property, the Contractor shall obtain written permission from the property owner and provide a copy to the Contract Administrator.

## D27. ENCROACHMENT ON PRIVATE PROPERTY

D27.1 Further to Section 3.11 of CW 1130 of the General Requirements, “Site Requirements”, the Contractor shall confine his Work to the public right-of-ways and construction easements at all times, except if he has received written permission from the property owner. The Contractor shall provide the Contract Administrator with a copy of any written permission he has received to enter onto private property.

D27.2 The Contractor’s construction activities shall be confined to the minimum area necessary for undertaking the Work and he shall be responsible for all damage to private property resulting from his Work. Particular care shall be taken to assure no damage is done to buildings, fencing, trees and plants, and provision shall be made to maintain full drainage for private properties during construction.

## D28. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D28.1 Further to Section 3.13 of CW 1130 of the General Requirements, “Site Requirements”, special care shall be taken to avoid damage to existing adjacent structures and properties during the course of Work.

D28.2 Any damage caused by the Contractor or his Subcontractors to the adjacent structures of properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

## D29. LAYOUT OF WORK

D29.1 Further to C6 and Standard Construction Specification CW 1130, Site Requirements, the Contract Administrator shall be responsible for survey control and layout for the underground work components.

D29.2 Further to C6 and Standard Construction Specification CW 1130, Site Requirements, the Contractor shall be responsible for survey and layout for all aerial supported force main components.

D29.3 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. He shall provide all required instruments and competent personnel for performing all layouts.

D29.4 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.

D29.5 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 his own expense.

D29.6 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed

or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

## D30. CONTRACTOR LIGHTING DURING CONSTRUCTION

D30.1 The Contractor shall not apply direct lighting to any nearby residential buildings for the construction of the Work.

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

D31.1 Further to C6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

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

D32.1 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.

## D33. CONFINED SPACE ENTRY

D33.1 The Contractor's attention is drawn to the Province of Manitoba Workplace Safety and Health Act ("the Act"), and the Regulations and Guidelines there-under pertaining to Confined Entry Work, and in particular the requirements for conducting hazard/risk assessment and providing personal protective equipment (PPE).

D33.2 The Contractor shall assist and provide Supplied Air Breathing Apparatus conforming to the requirements of the Act, Regulations and Guidelines for the use of the Contract Administrator where confined entry is required to allow for inspection of the Work.

## D34. ENVIRONMENTAL PROTECTION PROGRAM

D34.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Program as herein specified.

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

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

(xiii) Navigable Waters Best Practices; and

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

(b) Provincial

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

(ii) The Endangered Species Act, c.E111;

(iii) The Environment Act, c.E125;

(iv) The Fire Prevention Act, c.F80;

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

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

(vii) The Nuisance Act, c.N120;

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

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

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

(xi) The Workplace Safety and Health Act c.W210;

(xii) Current applicable Associated Regulations;

(xiii) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.; and

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

(c) Municipal

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

(ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000;

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

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

(v) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000;

(vi) The City of Winnipeg By-law No. 92/2010; and

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

D34.3 DFO has completed a localized impact assessment of the project and will be issuing a Letter of Advice. Work shall be undertaken with consideration of the mitigation measures outlined in DFO's letter. This letter will be provided to the Contractor when it is formally issued.

D34.4 A Notice of Alteration for Environment Act License 2716 RR is currently underway for this Project. The license shall be provided to the Contractor when it is formally issued. The Contractor shall comply with the requirements outlined in the licence.

D34.5 A City of Winnipeg Waterways permit is currently underway for this Project. The permit shall be provided to the Contractor when it is formally issued. The Contractor shall comply with the requirements outlined in the permit.

D34.6 Vessels shall have safe passage during the navigation period. Aids to navigation such as warning signs and flashing lights will be installed on the construction site. Signage, stating "Construction Ahead" will be placed on both riverbanks, 50 m upstream and 50 m downstream of the construction site, and maintained during all periods of open water. Signs shall be legible for a minimum distance of 50 m. The temporary work shall be marked with yellow flashing LED lights from dusk to dawn, and during all periods of restricted visibility.

D34.7 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

(i) Storage on construction materials shall be confined to the defined laydown areas as shown on the Contract Drawings or at a location approved by the Contract Administrator.

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

(iii) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.

(iv) Construction materials and debris shall be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

(b) Fuel Handling and Storage

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

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

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

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

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

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

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

(viii) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.

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

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

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

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

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

appropriate staff on Site shall be trained for proper handling of deleterious liquids (i.e. fueling) and trained in preventing and cleaning up minor spills.

(c) Waste Handling and Disposal

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

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

(iv) Different waste streams shall not be mixed.

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

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

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

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

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

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

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

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

(e) Emergency Response

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

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

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

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

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

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

(ii) Attend to public safety:

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

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

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

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

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

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

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

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

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

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

**TABLE 1**
**SPILLS THAT MUST BE REPORTED TO THE**
**MANITOBA CONSERVATION AS ENVIRONMENTAL ACCIDENTS**

| Classification | Hazard | Reportable quantity/level |
|---|---|---|
| 1 | Explosives | All |
| 2.1 | Compressed Gas (Flammable) | 100 L* |
| 2.2 | Compressed Gas | 100 L* |
| 2.3 | Compressed Gas (Toxic) | All |
| 2.4 | Compressed Gas (Corrosive) | All |
| 3 | Flammable Liquids | 100 L |
| 4 | Flammable Solids | 1 Kg |
| 5.1 PG** I & II | Oxidizer | 1 kg or 1 L |
| PG** III | Oxidizer | 50 kg or 50 L |
| 5.2 | Organic Peroxide | 1 kg or 1 L |
| 6.1 PG** I & II | Acute Toxic | 1 kg or 1 L |
| PG** III | Acute Toxic | 5 kg or 5 L |
| 6.2 | Infectious | All |
| 7 | Radioactive | Any discharge or radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface |
| 8 | Corrosive | 5 kg or 5 L |
| 9.1 | Miscellaneous (except PCB mixtures) | 50 kg |
| 9.2 | PCB Mixtures | 500 g |
| 9.3 | Aquatic Toxic | 1 kg or 1 L |
| 9.4 | Wastes (chronic toxic) | 5 kg or 5 L |

* Container capacity (refers to container water capacity)
** PG = Packing Group(s)

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

(f) Noise and Vibration

(i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, and the Province of Manitoba Environment Act Licence, unless otherwise accepted in advance by the Contract Administrator. The activities will generally be restricted to 7:00 a.m. to 7:00 p.m. weekdays with written permission of the Contract Administrator and the City of Winnipeg for any after-hours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities. Refer to D22, “Restricted Work Hours” for permitted hours of work.

(ii) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable

limits. The Contractor shall also demonstrate to the Contract Administrator that Works to be performed during the night-time period, on Sundays, and Holidays as stated in the Licence shall not exceed the approved limit.

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

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

(g) Dust and Emissions

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

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

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

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

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

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

(h) Erosion Control

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

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

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

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

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

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

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

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

(i) Runoff Control

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

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

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

(iv) Soil and fill shall not be stockpiled on immediate watercourse bank areas. Stockpile locations shall be presented for review and approval to the Contract Administrator.

(j) Fish

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

(ii) Culvert removal, instream bridge construction works, and embankment works shall be constructed during periods of low flow in the isolated site. Flowing water should be diverted around the construction area using a cofferdam and bypass pump. Water will be diverted in a manner that avoids sediment generation to downstream areas and does not alter the volume of flow in the watercourse. Use cofferdams 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 DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines. Ensure all isolation materials are completely removed from the watercourse once construction is complete.

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

(iv) The duration of Work and amount of disturbance to the bed and banks of the water body will be minimized.

(k) Wildlife

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

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

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

(l) Vegetation

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

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

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

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

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

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

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

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

(m) Landscaping

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

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

(n) Construction Traffic

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

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

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

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

(o) Access

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

D34.8 The Contractor shall provide or maintain general and off-street access to any affected business during construction.

## MEASUREMENT AND PAYMENT

### D35. PAYMENT

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

D35.2 Payment shall not be made until the Detailed Work Schedule has been submitted and approved by the Contract Administrator, in accordance with D15 and D16.

### D36. PAYMENT SCHEDULE

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

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

## WARRANTY

### D37. WARRANTY

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

## THIRD PARTY AGREEMENTS

### D38. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D38.1 In the event that funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D38.2 Further to D38.1, in the event that the obligations in D38 apply, actual costs legitimately incurred by the Contractor as a direct result of these obligations ("Funding Costs") shall be determined by the actual cost to the Contractor and not by the valuation method(s) outlined in C7.4. In all other respects Funding Costs will be processed in accordance with Changes in Work under C7.

D38.3 For the purposes of D38:

(a) **"Government of Canada"** includes the authorized officials, auditors, and representatives of the Government of Canada; and

(b) **"Government of Manitoba"** includes the authorized officials, auditors, and representatives of the Government of Manitoba.

D38.4 Modified Insurance Requirements

D38.4.1 If not already required under the insurance requirements identified in D11, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and its Ministers, officers, employees, and agents shall be added as additional insureds.

D38.4.2 If not already required under the insurance requirements identified in D11, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

D38.4.3 The Contractor shall obtain and maintain third party liability insurance with minimum coverage of two million dollars ($2,000,000.00) per occurrence on all licensed vehicles operated at the Site. In the event that this requirement conflicts with another licensed vehicle insurance requirement in this Contract, then the requirement that provides the higher level of insurance shall apply.

D38.4.4 Further to D11.3, insurers shall provide satisfactory Certificates of Insurance to the Government of Manitoba prior to commencement of Work as written evidence of the insurance required. The Certificates of Insurance must provide for a minimum of thirty (30) days' prior written notice to the Government of Manitoba in case of insurance cancellation.

D38.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D38.5 Indemnification By Contractor

D38.5.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D38.6 Records Retention and Audits

D38.6.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D38.6.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D38.6.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits, to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D38.7 Other Obligations

D38.7.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D38.7.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D38.7.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D38.7.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

D38.7.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D38.7.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

**FORM H1: PERFORMANCE BOND**
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 822-2020

BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE

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: LABOUR AND MATERIAL PAYMENT BOND**
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Principal"), and

_____ ,
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), for the use and benefit of claimants as herein below defined, in the amount of

_____

_____ dollars ($_____.____)

of lawful money of Canada, for the payment whereof we, the Principal and the Surety jointly and severally bind ourselves firmly by these presents.

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

TENDER NO. 822-2020

BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE

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 promptly make payment to all claimants as hereinafter defined, for all labour, service and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(a) A claimant is defined as one having a direct contract with the Principal for labour, service and material, or any of them, used or reasonably required for use in the performance of the contract, labour, service and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment (but excluding rent of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract;

(b) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant’s work, labour or service was done or performed, or materials were furnished by such claimant, may sue on this bond, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon;

(c) No suit or action shall be commenced hereunder by any claimant

(ii) unless claimant shall have given written notice to the Principal and the Surety above-named, within one hundred and twenty (120) days after such claimant did or performed the last of the work, labour or service, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work, labour or service was done or performed. Such notice shall be served by mailing the same by registered mail to the Principal, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the Province of Manitoba;

(iii) after the expiration of one (1) year following the date on which Principal ceased work on said Contract; including work performed under the guarantees provided in the Contract;

(iv) other than in a court of competent jurisdiction in the Province of Manitoba.

(d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

(e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

The Principal and Surety hereby agree that The Guarantors' Liability Act (Manitoba) shall apply to this Bond.

IN TESTIMONY WHEREOF, the Principal has hereunto set its hand affixed its seal, and the Surety has caused these presents to be sealed and with its corporate seal duly attested by the authorized signature of its signing authority this

_____ 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 J: SUBCONTRACTOR LIST

(See D13)

BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE

| Name | Address |
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**FORM K: EQUIPMENT**
(See D14)

BALTIMORE FORCE MAIN PIPE CROSSING THE ST. VITAL BRIDGE

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: _____

# 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 Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B7. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B7.

E1.4 The following are applicable to the Work:

| Drawing No. | Drawing Name/Title |
|---|---|
| 1-0221S-D0001-001 | Cover Sheet |
| 1-0221S-D0002-001 | Design Data and List of Drawings |
| 1-0221S-D0003-001 | Scope of Work |
| 1-0221S-D0004-001 | General Arrangement – Plan and Elevation |
| 1-0221S-D0005-001 | General Arrangement – Cross Sections |
| 1-0221S-M0001-001 | Mechanical – NPS 18 Force Main Across Bridge – Elevation |
| 1-0221S-M0002-001 | Mechanical – NPS 18 Force Main Across Bridge – Details – Sheet 1 of 2 |
| 1-0221S-M0002-002 | Mechanical – NPS 18 Force Main Across Bridge – Details – Sheet 2 of 2 |
| 1-0221S-S0001-001 | Structural – Overall Existing Girder Plan |
| 1-0221S-S0002-001 | Structural – Existing Girder Modification Sections – Sheet 1 of 2 |
| 1-0221S-S0002-002 | Structural – Existing Girder Modification Sections – Sheet 2 of 2 |
| 1-0221S-E0001-001 | Electrical – Site Plan |
| 1-0221S-E0002-001 | Electrical – North Riverbank Electrical Details |
| 1-0221S-E0003-001 | Electrical – South Riverbank Electrical Details |
| 1--0221S-E0004-001 | Electrical – Existing Wastewater Pumping Station Details |
| 1-0221S-E0005-001 | Electrical – RTU Panel & Wastewater Pumping Station Misc. Instrumentation Wiring Details |
| 1-0221S-C0001-001 | Civil – North River Bank Connection |
| 1-0221S-C0002-001 | Civil – South River Bank Connection |
| 1-0221S-C0003-001 | Civil – Details |
| 1-0221S-C0004-001 | Civil – Site Restoration |
| B-5015-109 | St. Vital Bridge Project – General Arrangement and Notes |
| B-5015-110 | St. Vital Bridge Project – Cross Sections and Deck Geometry |
| B-5015-111 | St. Vital Bridge Project – Diaphragms, Bracing and Jacking Beams |
| B-5015-112 | St. Vital Bridge Project – Girder G-1 |
| B-5015-113 | St. Vital Bridge Project – Girder G-2 and G-3 |
| B-5015-114 | St. Vital Bridge Project – Girder G-4 and G-5 |
| B-5015-115 | St. Vital Bridge Project – Girder G-6 |
| B-5015-116 | St. Vital Bridge Project – Typical Details |
| B116-88-6 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Plan and General Elevation of Existing Bridge |

| | |
|---|---|
| B116-88-7 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Plan and General Elevation of Proposed Bridge |
| B116-88-13 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Jacking Beam and Bearing Modifications |
| B116-88-47 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Sewage Forcemain Layout & Details |
| B116-88-48 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Sewage Forcemain Sections & Details |
| B116-88-49 | St. Vital Twin Bridge over Red River – Structure Rehabilitation and Related Works – Drain Inlet Modifications |
| MS-3C | Baltimore Forcemain Index |
| 781 | Baltimore Pumping Station – Detail of Substructure – Sec “A”, “B”, “C” |
| 782 | Baltimore Pumping Station – Detail of Substructure – Sec “D”, “E” & “F” |
| 05984-1 | Wastewater River Crossing Leak Monitoring – Kingston Row at St. Vital Bridge – Outlet Magmeter Installation – Structural Plans & Sections |
| 05985-1 | Wastewater River Crossing Leak Monitoring – Kingston Row at St. Vital Bridge – Outlet Magmeter Installation – Location Plan & Details |
| 06019-1 | Wastewater River Crossing Leak Monitoring – Churchill Drive at St. Vital Bridge – Inlet Magmeter Installation & Cable Conduit Installation |
| 1-0117L-M0001-001 | 2018 Bypass Pumping Assembly and Manhole Installation – Baltimore Force Main – Kingston Row to Churchill Drive |

## E2. SHOP DRAWINGS

E2.1 Description

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

(b) Further to C6.10, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract, or as reasonably required by the Contract Administrator.

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

E2.2 Shop Drawings

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

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

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

E2.3 Contractor’s Responsibilities

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

(b) Verify:

(i) Field measurements;

(ii) Field construction criteria; and

(iii) Catalogue numbers and similar data.

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

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

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

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

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

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

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

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

E2.4 Submission Requirements

E2.4.1 Allow for a ten (10) Business Day period for review by the Contract Administrator of each individual submission and re-submission, unless otherwise noted in the Contract Documents.

E2.4.2 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.

E2.4.3 Submissions shall include:

(a) Date and revision dates; and

(b) Project title and Bid Opportunity number.

E2.4.4 Name of:

(a) Contract;

(b) Subcontractor;

(c) Supplier;

(d) Manufacturer;

(e) Detailer (if applicable);

(f) Identification of product or material;

(g) Relation to adjacent structure or materials;

(h) Field dimensions, clearly identified as such;

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

(j) Applicable standard, such as CSA or CGSB numbers; and

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

E2.4.5 Other Considerations

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

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

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

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

(e) Submissions shall be in English.

## E3. MOBILIZATION AND DEMOBILIZATION

E3.1 Description

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

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

E3.2 Scope of Work

E3.2.1 The Work under this Specification shall include but not be limited to:

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

(b) Supplying, setting up, laying out, and removing site office facilities as detailed in E24 "Office Facilities";

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

(d) Maintaining and removing any access roadways;

(e) Performing any necessary short-term lane closures as detailed in E4, "Traffic Control and Management";

(f) Complying with all requirements outlined in D34, "Environmental Protection Program"; and

(g) Restoring all existing facilities.

E3.3 Reference Standards, Specifications, and Drawings

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

(i) The City of Winnipeg's Manual of Temporary Traffic Control in Work Areas on City Streets.

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E4 – Traffic Control and Management;

(iii) E5 – Pedestrian Protection; and

(iv) E24 – Office Facilities.

E3.4 Materials

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

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

E3.5 Equipment

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

E3.6 Construction Methods

E3.6.1 Layout of On-Site Work Facilities

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

(b) A possible location for the Contractor's staging area include City of Winnipeg park on the northeast side of the Red River, to the west of the playground, and beyond the existing trees, as shown on the Drawings. The Contractor should consider spring flood levels when proposing a location for temporary facilities. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas.

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

E3.6.2 Cellular Telephone Communication

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

E3.6.3 Secure Site Fencing

(a) A minimum 1.8 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7, "Substitutes", secure fence around the site 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.

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

E3.6.4 Access Roads

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

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

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

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

E3.6.5 Restoration of Existing Facilities

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

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. 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

(a) Mobilization and demobilization shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work. Payment will be based on the following breakdown:

| | | |
|---|---|---|
| (i) | Commencement of Construction | 25% |
| (ii) | During Construction | 50% |
| (iii) | Upon Completion of the Work | 25% |

## E4. TRAFFIC CONTROL AND MANAGEMENT

E4.1 Description

(a) This Specification shall cover all traffic control operations necessary for the removal and replacement of the Baltimore force main system crossing the St. Vital Bridge, as herein specified.

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

E4.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Undertaking any necessary short-term lane closures along Dunkirk Drive/Osborne Street, Churchill Drive, or Kingston Row;

(ii) Securing Work areas to provide safe pedestrian and vehicular access;

(iii) Installation of barricades in areas under construction, including chevrons or other directional signage to facilitate construction vehicle access and prevent general traffic access;

(iv) Installation, adjustment, and maintenance of sidewalk barricades stating “sidewalk closed;

(v) Installation, adjustment, and maintenance of signage and barricades beneath the St. Vital Bridge stating “pathway closed; and

(vi) Daily maintenance of all items listed above.

E4.3 Submittals

E4.3.1 General

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

E4.3.2 Temporary Lane Closures Along Dunkirk Drive/Osborne Street

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the commencement of any proposed temporary lane closures, a proposed temporary lane closure plan, including specific

requirements, details, and duration. This information will initiate review with the City's Traffic Management Branch.

E4.4 Reference Standards, Specifications, and Drawings

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

(i) The City of Winnipeg's Manual of Temporary Traffic Control in Work Areas on City Streets.

(b) The following Specifications:

(i) E2 – Shop Drawings;

(ii) E3 – Mobilization and Demobilization; and

(iii) E5 – Pedestrian Protection.

E4.5 Materials

E4.5.1 General

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

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

E4.6 Equipment

E4.6.1 General

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

E4.7 Construction Methods

(a) General

(i) The Contractor shall provide and maintain flagmen in accordance with the "Manual of Temporary Traffic Control in Work Areas on City Streets", issued by the City of Winnipeg. This includes the specified notification periods for any closures.

(ii) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the above-mentioned manual and shall, at all times, ensure that maximum protection is afforded to the road users and that his operations in no way interfere with the safe operation of traffic.

(iii) Long-term lane closures will not be permitted along Dunkirk Drive/Osborne Street. The Contractor shall plan their operations to minimize the occurrence of closures along this street and over the St. Vital Bridge.

(iv) The Contractor will be permitted to undertake a maximum of five (5) days of extended closures, extending beyond the short-term closures identified in E4.7(v) to accommodate offloading of materials and equipment and facilitate general access beneath the bridge.

(v) No closures along Dunkirk Drive/Osborne Street shall take place during peak periods – between 7:00 and 9:00 and between 15:00 and 18:00, Monday to Friday.

(vi) Improper signing will be sufficient reason for the Contract Administrator to immediately shut down the entire job.

(vii) Barricades supplied and installed by the Contractor shall show the telephone number(s) at which he can be reached twenty-four (24) hours per day, seven (7) days per week.

(viii) During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present a hazard to motorists or pedestrians.

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

(x) Where directed, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planning drop-offs to the satisfaction of the Contract Administrator.

(xi) The Contractor shall maintain access to all intersecting side streets and approaches within the project limits.

(xii) Ambulance / emergency vehicle access must be maintained at all times.

E4.8 Quality Control

E4.8.1 Inspection

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

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

E4.8.2 Access

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

E4.9 Measurement and Payment

E4.9.1 Traffic Control and Management

(a) Traffic control and management operations shall not be measured. This item of Work shall be paid for at the Lump Sum Price for "Mobilization and Demobilization", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

## E5. PEDESTRIAN PROTECTION

E5.1 Description

(a) This Specification shall cover all operations relating to the provision of safe access for pedestrians and cyclists around the construction site and on the paved and granular pathways under the St. Vital Bridge as specified herein.

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

E5.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) The supply, erection, and maintenance of pedestrian protection, as specified herein;

(ii) The provision of all signage necessary to direct pedestrian and bicycle traffic;

(iii) The provision of all other measures necessary to ensure safe pedestrian access through the construction site to the satisfaction of the Contract Administrator; and

(iv) It is intended that the Contractor provide pedestrian protection and guidance at all times during the Project.

E5.3 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, details of the proposed enclosure.

E5.4 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 2030 – Excavation Bedding and Backfill.

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E3 – Mobilization and Demobilization; and

(iv) E4 – Traffic Control and Management.

E5.5 Materials

E5.5.1 General

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

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

E5.6 Equipment

E5.6.1 General

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

E5.7 Construction Methods

E5.7.1 Pedestrian Protection Enclosure

(a) A pedestrian protection enclosure shall be installed at the location of the underbridge pathways at the following locations:

(i) Between Piers No. 1 and 2 (south of Churchill Drive); and

(ii) Between Piers No. 7 and 8 (north of Kingston Row), should any work platforms extend beneath the sidewalk.

(b) The enclosure shall be a minimum of 3000 mm high and 3000 mm wide and shall consist of support posts and minimum 13 mm thick plywood. The support posts shall have provision for anchorage to prevent movement or overturning of the pedestrian protection due to wind, hydraulic, or other loads. The pedestrian protection shall be designed for all applicable loading including wind loading in accordance with the requirements of the Manitoba Building Code. Adequate lighting shall be provided attached to the inside of the temporary pedestrian enclosure. Lighting shall be provided for the length of the pathway enclosure.

(c) The pedestrian protection enclosure must be removed no later than October 31, 2021.

(d) A sign shall be installed on each side of the structure instructing cyclists to dismount before entering the enclosure.

E5.7.2 Safety Precautions

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

E5.7.3 Maintenance of the Pedestrian Protection Enclosure

(a) The Contractor shall maintain the Pedestrian Protection Enclosure in good working order at all times to the satisfaction of the Contract Administrator.

(b) The sidewalk shall be kept free of all construction materials, debris, and equipment.

E5.8 Quality Control

E5.8.1 Inspection

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

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

E5.8.2 Access

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

E5.9 Measurement and Payment

E5.9.1 Pedestrian Protection

(a) Pedestrian protection shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Pedestrian Protection ", performed in accordance with this Specification and accepted by the Contract Administrator. “Pedestrian Protection " shall be pro-rated on a monthly basis over the construction period, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. Prorated payment shall be based on the following Work:

| | | |
|---|---|---|
| (b) | Installation | 40% |
| (c) | Maintenance | 30% |
| (d) | Removal | 30% |

## E6. MIGRATORY BIRD SPECIES

E6.1 Description

(a) This Specification shall cover all operations relating to the removal of existing bird nests and protection of openings where the new force main is to be installed to future nesting during the Work..

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

E6.2 Scope of Work

E6.2.1 The Work under this Specification shall include but not be limited to:

(a) Removing all existing nests prior to March 31, 2021;

(b) Installing netting and/or other means to prevent nesting during construction prior to March 31, 2021;

(c) Taking necessary precautions to prevent birds from nesting and

(d) Complying with the requirements outlined in D34, “Environmental Protection Program.

E6.3 Reference Standards, Specifications, and Drawings

(a) The following Specifications

(i) D34 – Environmental Protection Program.

(ii) E2 – Shop Drawings;

(iii) E12 – Removal of Existing Aerial Supported Force Main Pipe;

(iv) E14 – Structural Concrete;

(v) E15 – Force Main Structural Steel Support System; and

(vi) E16 – Force Main Across Bridge.

E6.4 Submittals

E6.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site and prior to implementation, a netting/protection plan shall including (at a minimum): details of product, installation technique and areas for exclusion, inspection and maintenance schedule, methods of removal, etc.

E6.5 Materials

E6.5.1 General

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

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

E6.5.2 Netting

(a) Netting shall consist of knotted polyethylene twine netting and shall be installed in accordance with the Transportation Association of Canada (TAC) *Operational Guidance for Migratory Bird Nests under Bridges and in Culverts,* circa March 2019. Maximum net hole opening size shall be 19mm (3/4”).

E6.6 Equipment

E6.6.1 General

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

E6.7 Construction Methods

E6.7.1 Migratory Bird Species

(a) The Contractor shall be aware that the bird species Petrochelidon Pyrrhonota, common name Cliff Swallows, are known to nest on the bridge deck soffits. Cliff Swallows fall under the protection of the Migratory Birds Convention Act, (MCBA). Removal of the existing aerial supported force main and installation of the new aerial

supported force main, appurtenances, structural steel support assembly installation, and concrete pier modifications, is not permitted between May 1st and August 15th if there are active nests present on the bridge.

(b) The Contractor shall remove all existing nests necessary to complete the Work prior to March 31, 2021. Work is permitted to be undertaken during this period if netting or other protective measures are installed on the bridge that prevents birds from building and accessing nests. The Contractor shall install and maintain netting for the duration of the Work and/or nesting period, and as instructed by the Contract Administrator. The Contractor is not permitted to harm or disturb birds during the nesting period (May 1-August 15) and shall take all precautions to prevent birds from nesting.

(c) Adjustments to the placement of the netting or additional coverage of areas may be required and shall be at the direction of the Contract Administrator.

E6.8 Quality Control

E6.8.1 Inspection

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

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

E6.8.2 Access

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

E6.9 Measurement and Payment

E6.9.1 Migratory Bird Species

(a) Removal of existing nests and the supply and installation of netting/protection to prevent nesting during construction, and maintenance, repair, and/or adjustment of netting/protection shall be considered incidental to the Work and no separate measurement or payment shall be made.

## E7. RIVERBANK EXCAVATION

E7.1 Description

(a) This Specification shall cover all operations relating to excavation operations adjacent to the Red River to facilitate installation of the replacement force main system, as herein specified.

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

E7.2 Scope of Work

E7.2.1 The Work under this Specification shall include but not be limited to:

(a) Excavating all material required to construct the Works;

(b) Off-site disposing of surplus and unsuitable material;

(c) Dewatering of all excavations, as required; and

(d) Complying with the requirements outlined in D34, “Environmental Protection Program.

E7.3 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications
  (i) CW 2030 – Excavation Bedding and Backfill;
  (ii) CW 2130 – Gravity Sewers; and
  (iii) CW 2160 – Concrete Underground Structures and Works.

(b) The following Specifications
  (i) D34 – Environmental Protection Program;
  (ii) E2 – Shop Drawings; and
  (iii) E8 – Silt Fence Barrier.

E7.4 Submittals

E7.4.1 General

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

E7.5 Materials

E7.5.1 General

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

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

E7.6 Equipment

E7.6.1 General

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

E7.7 Construction Methods

E7.7.1 Alterations to Site

(a) 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.

(b) All excess excavated material shall become the property of the Contractor and shall be removed from the Site. Excavated material shall not be disposed of in a manner that will obstruct the flow of watercourse.

E7.7.2 Protection of Existing Embankment Slopes and Riverbanks

(a) The Contractor shall not disturb the embankment slopes outside the excavation limits and shall not dump excavated material onto the roadway embankment or the riverbank.

(b) Excavation sequence shall be done in a “top down” direction, in order to maintain stability.

(c) All material shall be brought to the surface by approved method, and shall be disposed of away from the Site and not into the existing river channel. Shored excavations shall be dewatered and maintained dewatered so that the material is excavated in its natural state. The bottom of the excavation shall be kept free from excessive moisture or free-flowing water.

E7.7.3 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Sturgeon Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D34, “Environmental Protection Program”.

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

(c) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

E7.8 Quality Control

E7.8.1 Inspection

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

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

E7.8.2 Access

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

E7.9 Measurement and Payment

E7.9.1 Riverbank Excavation

(a) Implementation of riverbank excavation practices shall be considered incidental to the Work and no separate measurement or payment shall be made.

## E8. SILT FENCE BARRIER

E8.1 Description

(a) This Specification shall cover all operations relating to the work necessary for the supply, installation, and maintenance of silt fence barrier, as herein specified.

(b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in D34, “Environmental Protection Program”.

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

E8.2 Scope of Work

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

(b) Supplying and installing temporary silt fence barrier;

(c) Maintaining silt fence barrier until final site restoration;

(d) Removing silt fence barrier; and

(e) Complying with all requirements outlined in D34, “Environmental Protection Program”.

E8.3 Submittals

E8.3.1 General

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

E8.4 Reference Standards, Specifications, and Drawings

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

(i) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft$^3$ (600 kN-m/m$^3$);

(ii) ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method;

(iii) ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus;

(iv) ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity;

(v) ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles;

(vi) ASTM D4632 – Grab Breaking Load and Elongation of Geotextiles;

(vii) ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile; and

(viii) ASTM D4833 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.

(b) The latest version of the City of Winnipeg Standard Construction Specifications

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

(c) The following Specifications

(i) D34 – Environmental Protection Program

(ii) E2 – Shop Drawings; and

(iii) E7 – Riverbank Excavation.

E8.5 Materials

E8.5.1 General

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

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

E8.5.2 Handling and Storage of Materials

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

E8.5.3 Fence Posts

(a) Fence posts shall be 38x38 mm untreated wood posts, 41 mm steel tee posts, or punched steel U posts, minimum length of 1.2 m.

E8.5.4 Filter Fabric

(a) Filter fabric shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

| Property | Test Method | Value |
|---|---|---|
| Grab Tensile Strength | ASTM D4632 | 0.55 kN |
| Grab Tensile Elongation | ASTM D4632 | 15% |
| Mullen Burst | ASTM D3786 | 2060 kPa |
| Puncture | ASTM D4833 | 0.285 kN |
| Trapezoid Tear | ASTM D4533 | 0.285 kN |
| UV Resistance | ASTM D4355 | 80% @ 500 hrs |
| Apparent Opening Size (AOS) | ASTM D4751 | 0.60 mm |
| Flow Rate | ASTM D4491 | 405 l/min/m² |

(b) The fabric shall be inert to commonly encountered soil chemicals, hydrocarbons, mildew and bacteria:

E8.5.5 Wire Mesh

(a) Wire mesh shall be galvanized or plain metal with 3.0 mm wire gauge and wire spacing @ 150 mm o/c.

E8.5.6 Fencing Material Fasteners

(a) Staples or wire ties of sufficient strength and spacing to withstand a 530N (120lbf) pull test at any point on the wire mesh.

E8.6 Equipment

E8.6.1 General

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

E8.7 Construction Methods

E8.7.1 General

(a) Final locations of the silt fence barrier will be dependent upon site conditions and the Contractor's activities and methods, and may require adjustment.

(b) Locations of silt fence barrier will be confirmed on site with the Contract Administrator.

(c) Work shall be undertaken in accordance with D34, "Environmental Protection Program" to prevent deleterious substances from entering into the Red River during construction.

E8.7.2 Silt Fence Barrier Installation

(a) Excavate a 150 x 150 anchor trench along alignment of silt fence barrier.

(b) Install fence posts in accordance with Manufacturer's recommended installation methods. Fence posts shall be firmly driven into undisturbed soil, or are completely and firmly backfilled if installed via auger methods.

(c) Attach wire mesh as support backing for silt fence barrier filter fabric with specified fasteners. Attach silt fence barrier filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450 mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid within the anchor trench.

(d) Install and compact impermeable excavated materials into anchor trench and slope as required. Compact to 95% of maximum dry density in accordance with ASTM D-698.

E8.7.3 Silt Fence Barrier Maintenance

(a) Silt fence barrier shall be inspected daily and prior to commencing other construction activities.

(b) All silt fences shall be inspected immediately after runoff event and at least daily during prolonged rainfall or runoff. Any required repairs shall be made immediately. The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through and under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging. Fence posts shall remain upright and shall not be loosely placed into the ground.

(c) Accumulated sediment that is 300 mm or greater in depth shall be carefully removed and disposed of offsite without disturbing the silt fence barrier. Accumulated sediment shall also be removed as necessary to perform maintenance repairs. Accumulated sediment shall be removed immediately prior to removal of the silt fence barrier.

E8.7.4 Silt Fence Barrier Removal

(a) Remove silt fences following completion of all site construction activities (including final restoration and cleanup) and after installation of all permanent erosion control measures and satisfactory establishment of permanent vegetation.

(b) Restore areas disturbed, without releasing any deleterious substances to the adjacent watercourse.

E8.7.5 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into the Red River from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D34,“Environmental Protection Program.

E8.8 Quality Control

E8.8.1 Inspection

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

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

E8.8.2 Access

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

E8.9 Measurement and Payment

E8.9.1 Silt Fence Barrier

(a) Supplying, installing, maintaining, and removing silt fence barrier shall be considered incidental to the Work and no separate measurement or payment shall be made.

(b) Removal of accumulated sediment from the silt fence shall be considered incidental to the Work and no separate measurement or payment shall be made.

(c) Temporary removal and reinstallation of the silt fence to facilitate other project activities such as revegetation shall be considered incidental to the Work and no separate measurement or payment shall be made.

## E9. PROTECTION OF EXISTING TREES

E9.1 Description

(a) This Specification shall cover all operations relating to taking all necessary precautious to prevent damage to existing trees within the limits of Work, as herein specified.

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

E9.2 Construction Methods

E9.2.1 Protecting Existing Trees

(a) The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

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

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

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

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

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

(c) Elm trees shall not be pruned at any time between April 1 and July 31.

E9.3 Measurement and Payment

E9.3.1 Protection of Existing Trees

(a) Protection of existing trees will not be measured and payment shall be considered incidental to the Work.

## E10. WATER OBTAINED FROM THE CITY

E10.1 Further to Clause 3.7 of the latest version of the City's Standard Construction Specification CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

## E11. EXPLORATION OF EXISTING UTILITIES

E11.1 Description

(a) This Specification shall cover the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the

recovery of excavated material by vacuum type means or equivalent method, as approved by the Contract Administrator, and exposing of existing larger diameter and high pressure gas lines prior to roadway and sidewalk excavation for the purpose of determining their actual elevation.

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

E11.2 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications:

(i) CW 1120 – Existing Services, Utilities and Structures;

(ii) CW 1130 – Site Requirements; and

(iii) CW 2030 – Excavation Bedding and Backfill.

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E7 – Riverbank Excavation; and

(iii) E17 – Force Main Connections and Related Works.

E11.3 Submittals

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

E11.4 Materials

E11.4.1 General

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

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

E11.4.2 Backfill Material

(a) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand in accordance with CW 2030.

E11.5 Equipment

E11.5.1 General

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

E11.5.2 Hydro-Excavation Equipment

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

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

E11.6 Construction Methods

E11.6.1 Hydro-Excavation

(a) Prior to any excavation taking place on site, the Contractor shall expose the line in question by hydro-excavation.

(b) The Contractor shall arrange for all required utility locations, safety watches and other required notifications.

(c) The Contractor shall verify the location and elevations of buried utilities including but not limited to sewers, force mains, watermains, large diameter fire service watermains, gas mains, power and telecommunications ducts and conduits, traffic signal conduits, street lighting and other communication cables at proposed crossing locations in accordance with CW 1120 Clause 3.3.

(d) The Contractor shall provide the Contract Administrator with a minimum of 24 hours advanced notice prior to conducting utility exposures.

(e) Hydro-excavation for the determination of gas, sewer and watermain elevations and locations for tie ins must be pre-approved by the Contract Administrator.

(f) Once the elevation of the top of the pipe or duct has been determined the resulting excavation shall be backfilled with bedding sand to the elevation of the existing ground.

E11.6.2 Hydro Removal of Earthen Material

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

E11.6.3 Recovery of Excavated Material

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

(b) The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filing with excavated material.

(c) The use of mechanical sweepers will not be allowed.

(d) Dispose of material in accordance with Section 3.4 of CW 1130.

E11.7 Quality Control

E11.7.1 Inspection

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

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

E11.7.2 Access

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

E11.8 Measurement and Payment

E11.8.1 Exploration of Utilities

(a) Hydro-excavation of earthen material and its recovery and disposal for the exploration of buried utilities will not be measured and payment shall be considered incidental to the Work.

E11.8.2 Exploration of Gas, Sewers and Watermains

(a) Hydro-Excavation of earthen material and its recovery and disposal for the exploration of sewers and watermains to conform elevations and connection points shall be

considered incidental to the Work and no separate measurement or payment shall be made.

## E12. REMOVAL OF EXISTING AERIAL SUPPORTED FORCE MAIN PIPE

E12.1 Description

(a) This Specification shall cover all temporary work operations necessary for the removal of the existing force main pipe crossing the St. Vital Bridge, as herein specified.

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

E12.2 Scope of Work

E12.2.1 The Work under this Specification shall include but not be limited to:

(a) Installing temporary work platforms;

(b) Disinfecting the existing force main pipe;

(c) Removing and disposing of the existing force main pipe;

(d) Removing and disposing of the existing force main bearings;

(e) Removing and disposing of the existing structural steel support assembly; and

(f) Complying with all requirements outlined in D34, “Environmental Protection Program”.

E12.3 Submittals

E12.3.1 General

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

E12.3.2 Force Main Removal Plan

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule, clearly illustrating the method and sequence by which he proposes to perform the force main removals, including a description of the measures that will be implemented to meet the environmental requirements. The demolition procedure shall include detailed design notes and Shop Drawings that are sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba necessary to describe the following:

(i) Work platforms/demolition catch platforms;

(ii) Type and capacity of equipment;

(iii) Sequence of operations; and

(iv) Description of the measures that will be implemented to meet the requirements of D34, “Environmental Protection Program”.

E12.4 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 2125 – Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water Services;

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E15 – Force Main Structural Steel Support System; and

(iv) E16 – Force Main Across Bridge.

E12.5 Materials

E12.5.1 General

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

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

E12.6 Equipment

E12.6.1 General

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

E12.6.2 Demolition Catch Platforms and Work Platforms

(a) The Contractor shall provide all necessary access/work platforms to facilitate removal of the existing force main and associated inspection of all Works by the Contract Administrator.

(b) Demolition catch platforms and work platforms may extend beneath the underside of the girders a maximum of three (3) metres.

(c) All access/work platforms shall be restored to the preconstruction condition or better, which shall be considered incidental to the Work.

E12.7 Construction Methods

E12.7.1 General

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

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

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

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

(e) Traffic and pedestrian control shall conform to the requirements of E4, “Traffic Control and Management” and E5 “Pedestrian Protection”.

(f) No demolition products are to find their way into the watercourse. The Contractor shall take all necessary precautions to ensure that material do not fall onto any roadways or sidewalks during removal operations.

(g) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.

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

E12.7.2 Remove Existing Force Main Pipe

(a) Flush and disinfect existing pipe prior to removal. This shall be done in accordance with CW 2125. Disinfect with 5 mg/l chlorine solution, directing all wastewater into a wastewater sewer.

(b) Remove existing pipe so that no demolition products find their way into the watercourse.

E12.7.3 Remove Existing Structural Steel Pipe Support Assembly

(a) Remove existing force main structural steel pipe support assembly.

(b) Remove existing force main bearing support assemblies.

E12.7.4 Waste Handling and Disposal of Removed Materials

(a) Dispose of all surplus and unsuitable material off-site, in accordance with D34, “Environmental Protection Program”.

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

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

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

E12.7.5 Details of Existing Structure

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

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

(c) Applicable existing drawings of the St. Vital Bridge have also been provided with this Bid Opportunity for reference.

E12.8 Quality Control

E12.8.1 Inspection

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

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

E12.8.2 Access

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

E12.9 Measurement and Payment

E12.9.1 Removal of Existing Aerial Supported Force Main Pipe

(a) Removal of the existing aerial supported force main pipe shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, “Remove Existing Aerial Supported Force Main Pipe”, performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

## E13. REINFORCING STEEL

E13.1 Description

(a) This Specification shall cover all operations relating to the supply, fabrication, and placement of black reinforcing steel, and associated bar accessories, as specified herein and as shown on the Drawings.

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

E13.2 Scope of Work

(a) The Work under this Specification shall involve supplying and installing all black steel reinforcing, as shown on the Drawings.

E13.3 Submittals

E13.3.1 Shop Drawings

(a) The Contractor submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the Shop Drawings including bar lists, and the mill certificates for black steel reinforcing.

(b) Shop Drawings shall be submitted in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

E13.4 Reference Standards, Specifications, and Drawings

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

(i) ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes;

(ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;

(iii) ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;

(iv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(v) CAN/CSA G30.18 – Billet-Steel Bars for Concrete Reinforcement; and

(vi) Reinforcing Steel Institute of Canada (RSIC) – Reinforcement Steel Manual of Standard Practice.

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E14 – Structural Concrete;

(iv) E15 – Force Main Structural Steel Support System; and

(v) E16 – Force Main Across Bridge.

E13.5 Materials

E13.5.1 General

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

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

E13.5.2 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition and all subsequent revisions of CAN/CSA-A23.1, “Storage of Materials”, except as otherwise specified herein.

(b) Bundles of reinforcing steel shall be identified by tags containing bar marks.

(c) The Contractor shall handle and store the reinforcing steel in a manner that ensures it is not damaged or contaminated with dirt or other materials.

(d) The reinforcing steel shall not be placed directly on the ground. Timber pallets shall be placed under the reinforcing steel to keep them free from dirt and mud and to provide easy handling.

E13.5.3 Reinforcing Steel

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

(b) Reinforcing steel for the abutments, piers, wingwalls, pipe piles and girders, as shown on the Drawings and shall conform to the requirements of CAN/CSA G30.18, Grade 400W.

(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.

(d) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects.

E13.5.4 Bar Accessories

(a) Bar accessories shall be of types suitable for each type of reinforcing and 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 made from cementitious material. No plastic or PVC, or galvanized bar supports shall be used. The use of bar chairs, bolsters, and bar supports shall be selected to minimize contact area to the finished concrete surface, especially on exposed concrete faces. The use of large concrete blocks will not be considered acceptable for these locations.

(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 for black steel reinforcing.

(f) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract

Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E13.5.5 Bonding Agent/Grout

(a) Epoxy resin shall be conform to the requirements of ASTM C881. Type I or Type IV, Grade 3 epoxy shall be used for bonding reinforcing steel into hardened concrete. An approved product is Hilti RE500 or equal, as approved by the Contract Administrator in accordance with B7, “Substitutes”.

(b) An aggregate filler may be used in accordance with manufacturer's directions when the drilled hole is sized for the head of a stud rather than a shaft only.

(c) Bonding agents for bonding reinforcing steel into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within 48 hours after installation.

(d) Fabrication of stainless steel reinforcing shall take place in an area isolated from carbon steel reinforcing to prevent surface contamination.

(e) Stainless steel reinforcing shall be stored separately from carbon steel reinforcing.

(f) All equipment shall be cleaned prior to bending stainless steel reinforcing

E13.6 Equipment

E13.6.1 General

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

E13.7 Construction Methods

E13.7.1 Fabrication of Reinforcing Steel

(a) All reinforcing steel shall be fabricated in accordance with CAN/CSA G30.18M and the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.

E13.7.2 General Placing and Fastening 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 shall not be permitted.

(d) Reinforcing steel shall be placed 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 re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel shall not be permitted without prior acceptance by the Contract Administrator.

(f) Reinforcing steel shall be placed within the tolerances specified in CAN/CSA A23.1.

(g) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in

the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.

(h) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel, shall be as specified in E13.5.4 “Bar Accessories”.

(i) Welding or tack welding is not permitted.

(j) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

E13.7.3 Splicing

(a) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings will not be permitted without the written approval of the Contract Administrator.

(b) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of thirty-five (35) bar diameters lap length shall be provided.

E13.7.4 Installing Reinforcing Steel into Hardened Concrete

(a) The Contractor shall drill holes into adjacent slabs for hooks of the diameters and depths specified for each size of reinforcing steel, as shown on the Drawings. Drill bits shall have a diameter no larger than 2 mm larger than the nominal dowel, tie bar, or stud diameter.

(b) Holes shall be located to the correct depth and alignment as indicated on the Drawings. The spacing of the holes shall be as per RSIC.

(c) Drilling equipment shall be operated so as to ensure that no damage to the pavement results from such drilling operation. Coring of holes is not permitted. In the event that existing reinforcing steel bars are hit during the drilling operations, the hole shall be abandoned and a new hole shall be drilled nearby to the correct depth. All abandoned holes shall be filled with non-shrink grout.

(d) Holes for reinforcing steel shall be blown clean with compressed air. Bonding agent shall be placed in the back of the drilled hole. The reinforcing steel shall be worked back into the holes for complete coverage around the portion of the bar that extends into the hole, such that bonding agent is squeezed from the hole.

(e) Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any new concrete is placed. Otherwise, the concrete may be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

E13.7.5 Dissimilar Metals in Concrete

(a) Where the presence of dissimilar metals is present between adjacent miscellaneous or structural steels, polyethylene spacers shall be provided, as approved by the Contract Administrator.

(b) Provide a minimum 25mm cover between dissimilar metals.

E13.8 Quality Control

E13.8.1 Inspection

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

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

(c) A minimum of one (1) Business Day advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcing steel.

(d) After all reinforcing steel has been placed; a final inspection shall be made prior to the placement of concrete to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Contract Administrator before concrete is placed.

E13.8.2 Access

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

E13.9 Measurement and Payment

E13.9.1 Black Steel Reinforcing

(a) Supplying and placing black steel reinforcing shall not be measured. This item of Work shall be considered incidental to the Lump Sum Price for " Supply and Place Structural Concrete – Pier Modifications ", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

## E14. STRUCTURAL CONCRETE

E14.1 Description

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

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

E14.2 Scope of Work

(a) The Work under this Specification shall involve the following structural concrete Works:
  (i) Pier Modifications; and
  (ii) Drainage Channel.

E14.3 Reference Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:
  (i) ACI 309 – Guide for Consolidation of Concrete;
  (ii) ACI 347 – Guide to Formwork for Concrete;
  (iii) American Concrete Publication SP4 – Formwork for Concrete;
  (iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;
  (v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
  (vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

(vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

(viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;

(ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;

(x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

(xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;

(xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;

(xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);

(xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);

(xv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;

(xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(xix) CAN/CSA O121 – Douglas Fir Plywood;

(xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;

(xxi) CAN/CSA S269.1 – False Work for Construction Purposes;

(xxii) CAN/CSA S269.3 – Concrete Formwork;

(xxiii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

(xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and

(xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Materia.

(b) The following Specifications:

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings; and

(iii) E15 – Force Main Structural Steel Support System; and

(iv) E16 – Force Main Across Bridge.

## E14.4 Submittals

### E14.4.1 General

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

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

### E14.4.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the

Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

(b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:

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

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

(iii) Aggregate source location(s);

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

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

(c) The limits for slump;

(i) The limits for air content; and

(ii) Quantity of other admixtures.

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

(e) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

(f) 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.

E14.4.3 Concrete Mix Design Test Data

(a) Concrete

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

(ii) Testing for air void system shall be completed in accordance with E14.8.5(c).

(iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) Aggregate

(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.

E14.4.4 Notification of Ready Mix Supplier

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

E14.4.5 Temporary False Work, Formwork and Shoring Works

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

(b) Design Requirements

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

(ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract

Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the precast concrete girders will not be accepted. Any inserts to remain the structure must be non-rusting and not dissimilar to metals within the structural element.

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

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

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

(vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(vii) Formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(viii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.

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

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

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

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

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

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

(c) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E14.4.6 Temperature Management Plan

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to scheduled commencement of concrete placement, a Temperature Management Plan for all mass concrete prior to commencement of any placing concrete.

(i) Mass concrete is defined as all structural concrete with a minimum thickness or dimension of 1.0 metres or more.

(ii) The Temperature Management Plan shall include methods to control peak temperature and excessive temperature differentials, equipment used to monitor temperatures, corrective actions if readings are in non-conformance with the requirements of CAN/CSA A23.1, and reporting. At a minimum, the plan must include the following:

- A minimum of two groups of thermal monitors (thermocouples) shall be provided for each mass concrete component. More groups may be required based on shape of component, hoarding conditions, etc. With reference to the longest dimension of the component, one group shall be placed in the middle of the structure and the other near the edge. Generally each grouping will consist of a sensor in the core, edge of reinforcing, and exterior face of concrete (i.e. interior face of formwork). The core shall be defined as no less than 1.5 m into the component, or the middle if that dimension is less than 3.0 m;
- Unformed surfaces that will receive wet curing are typically covered with tarps or other insulating blankets. The surface temperature under the wet curing system shall also be taken;
- Ambient air temperatures shall be taken for each component. For components that are hoarded, the temperatures shall be taken inside the hoarding. External ambient air temperatures shall be taken for reference as well;
- Using the temperatures from the thermal monitors, surface temperatures, and ambient air temperatures, the temperature differentials of each grouping shall be provided for two directions of monitoring; core to formed concrete face (side), and core to unformed concrete face (top);
- The frequency of monitoring after final placement of concrete for each mass concrete component shall be as follows:
- 0-48 hours: once every hour;
- 48 hours to end of wet curing period (7 days): once every four hours; and,
- In winter conditions: once every 12 hours until core temperature reaches 0°C.
- It is recommended to use digital monitoring devices and standard spreadsheets for their ease of tracking. Upon completion of monitoring for each component, the information shall be saved and distributed to the Contract Administrator.

(b) Peak concrete temperature and thermal differentials shall be maintained in accordance with CAN/CSA A23.1. The effect of mass concrete both in terms of cold weather and hot weather concreting should be addressed.

(c) The Temperature Management Plan shall be prepared in accordance with the requirements of CAN/CSA A23.1 and shall include provisions for monitoring the temperature of the mass concrete pours and ambient temperature from time of placement until such time as management measures are no longer required.

E14.5 Materials

E14.5.1 General

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

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

E14.5.2 Handling and Storage of Materials

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

E14.5.3 Concrete

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

(b) Concrete shall have nominal compressive strengths ($f'_c$) and meet the requirements for hardened concrete as specified in the following Table E14.1.

**TABLE E14.1**
**REQUIREMENTS FOR HARDENED CONCRETE**

| Type of Concrete | Location | Nominal Compressive Strength MPa | Class of Exposure | Air Content Category | Max Aggregate Size |
|---|---|---|---|---|---|
| Type 1 | Pier Modifications | 35 @ 28 Days | C-1 | 1 | 20 mm |
| Type 2 | Drainage Channel | 35 @ 28 Days | C-1 | 1 | 20 mm |

E14.5.4 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.

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

(b) Fine Aggregates

(i) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong,

durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

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

(c) Coarse Aggregate – Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

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

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

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

E14.5.5 Admixtures

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

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

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

E14.5.6 Cementitious Material

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

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

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.

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

E14.5.7 Water

(a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CAN/CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E14.5.8 Formwork

(a) Formwork materials shall conform to CAN/CSA A23.1, 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-M1978, a minimum of 20 mm thick.

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

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

(e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or galvanized steel. They shall not stain, blemish, or spall the concrete surface for the life of the concrete. Where there may be interaction between stainless steel reinforcing and formwork accessories, accessories should also be stainless steel. Black steel accessories will not be considered acceptable for any exposed surfaces.

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

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

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

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

E14.5.9 Form Coating

(a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, “Clean Strip” by Dayton Superior or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E14.5.10 Permeable Formwork Line

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. This formwork liner shall be used on all exposed 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.

E14.5.11 Curing Compound

(a) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.

(b) Type 2 shall only be used on surfaces that will not be exposed to view.

(c) An approved product is WR Meadows 1215 WHITE Pigmented Curing Compound, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes.

E14.5.12 Curing Blankets

(a) (a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour. An approved product is “Mirafi Geotextile P150”. Alternately, a 10 oz burlap, 5 mil polyethylene, curing blanket white in colour shall be used; “Curelap” manufactured by Midwest Canvas, together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes.

E14.5.13 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

(i) The grout for bonding all hardened concrete surfaces to fresh 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
- 1 ½ 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.

E14.5.14 Epoxy Adhesive

(a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with, B7, “Substitutes.

E14.5.15 Epoxy Grout

(a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with, B7, “Substitutes.

E14.5.16 Cementitious Grout

(a) Cementitous grout shall be nonshrink and nonmetalic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with, B7, “Substitutes”. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E14.5.17 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.

E14.5.18 Steel Threaded Anchor Bolts

(a) Steel anchor bolts, nuts, and washers shall conform to the requirements of ASTM F1554, Grade 55, with the top 300 mm of the bolts threaded UNC Class 2A.

(b) Anchor bolts, nuts, and washers shall be hot dip galvanized to conform to the requirements of ASTM F2329.

E14.5.19 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

E14.6 Equipment

E14.6.1 General

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

E14.6.2 Vibrators

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

(b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel and stainless steel reinforcing, such as in locations that the existing deck reinforcing is exposed.

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

E14.7 Construction Methods

E14.7.1 General

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

E14.7.2 Pier Modifications

(a) Pier works shall comprise of the Work associated with the cast-in-place concrete modifications for pier caps at Pier Nos. 2, and 7, as shown on the Drawings.

(b) Anchor bolts shall be aligned with a template above the top of concrete and removed following a minimum twenty-four (24) hour curing period.

E14.7.3 Drainage Channel

(a) Concrete drainage channel works shall comprise of the removal and replacement of the concrete drainage channel on the south side of the riverbank.

(b) The work shall also involve the installation of a concrete contraction joint, as shown on the Drawings.

E14.7.4 Temporary False Work, Formwork and Shoring

(a) Construction Requirements

(i) Temporary false work, formwork, and shoring shall satisfy all requirements of the Navigable Waters best practices. The permits are presently being finalized, but will be made available to the Contractor prior to commencement of the Work.

(ii) The Contractor shall construct false work, formwork and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted Shop Drawings.

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

(iv) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted Shop Drawings.

(v) 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.

(vi) 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.

(vii) 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.

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

(ix) 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.

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

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

(xii) 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.

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

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

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

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

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

(f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour to match the surrounding concrete.

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

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

(i) 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.

E14.7.5 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.

E14.7.6 Supply of Structural Concrete

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

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

(c) Time of Hauling

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

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

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

(iv) Unless otherwise noted in Table E14.1, “Requirements for Hardened Concrete”, no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CAN/CSA A23.1 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers’ designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the 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;
- In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and
- The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E14.7.7 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 concrete surfaces are to be prepared to produce a rough, clean, free of laitance surface meeting the requirements of a CSP 4 concrete surface profile in accordance with the ICRI Guideline No. 03732. The surface shall be kept clean until concrete placement.

(iii) Cleaning and preparation of existing pier concrete shall take place in accordance with ICRI Guideline No. 03730. Should existing steel or reinforcing steel be exposed, concrete shall be removed to a maximum of the mid height of the bar, and as directed by the Contract Administrator.

(iv) The use of chemicals for hardening of concrete surfaces shall not be permitted, unless authorized in writing by the Contract Administrator.

(v) Immediately prior to placing new concrete 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.

E14.7.8 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 all structural concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/$m^2$/h. Fog misting is mandatory for deck concrete regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.

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

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

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

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

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

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

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

(ix) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

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

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

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

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

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

E14.7.9 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.

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

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

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

(c) Type 2 Finish – Unformed Surface

(i) 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.

(ii) 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.

(iii) 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.

(iv) Exposed concrete surfaces shall be given a transverse broomed finish using a coarse broom to produce regular corrugations to a maximum depth of 2 mm. An edging tool shall be used at all edges.

E14.7.10 General Curing Requirements

(a) Refer to E14.7.13, “Cold Weather Concreting” for cold weather curing requirements and E14.7.14, “Hot Weather Concreting” of this Specification for hot weather curing requirements.

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

(c) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.

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

(e) All concrete shall be cured for a period of seven (7) days. Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

(f) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator. Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.

(g) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly and by roller.

(h) Where curing compound is permitted, and following the completion of finishing operations, the surface shall be sprayed with an initial coating of curing compound, in

accordance with the Manufacturer's recommended methods. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

E14.7.11 Form Removal

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

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

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

E14.7.12 Patching of Formed Surfaces

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

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

(c) Patching of formed surfaces shall take place within 24 hours of formwork removal. In the event that patching must be delayed beyond twenty-four (24) hours, surfaces to be patched shall be kept in a saturated surface dry condition until patching takes place.

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

(e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

(g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E14.7.13 Cold Weather Concreting

(a) The requirements of CAN/CSA A23.1 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5°C during placing or curing.

E14.7.14 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

(ii) Evaporation reducer applied according to the Manufacturer's specifications may be used as an alternate to fog misting. MasterKure ER 50 (formerly Confilm) manufactured by BASF is an accepted product.

(iii) 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.

(iv) 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.

(v) 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.

(vi) Sun shades and wind breaks shall be used as required during placing and finishing.

(vii) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

(viii) 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.

(ix) 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 E16.3, "Acceptable Concrete Temperatures", for the indicated size of the concrete section.

**TABLE 16.3:**
**ACCEPTABLE CONCRETE TEMPERATURES**

| THICKNESS OF SECTION, M | TEMPERATURES °C | |
|---|---|---|
| | MINIMUM | MAXIMUM |
| Less than:<br>1<br>1.2 | <br>10<br>5 | <br>27<br>25 |

E14.7.15 Cleanup

(a) The Contractor shall cleanup equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E14.8 Concrete Quality

E14.8.1 Inspection

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

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

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E14.8.2 Access

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

E14.8.3 Materials

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

(b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.

(c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.

(d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E14.8.4 Quality Assurance and Quality Control

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

(b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

(f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. An outline of the quality tests (required for both Quality Control and Quality Assurance during construction) is indicated below.

E14.8.5 Concrete Testing

(a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E14.4.2, “Concrete Mix Design Requirements” of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in, E14.4.2, “Concrete Mix Design Requirements” of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457 for all types of concrete. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

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

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

(f) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

(g) Should the Contractor propose to introduce loads to the permanent concrete structure prior to the concrete obtaining its specified design strength (e.g. stripping formwork for cast-in-place suspended slabs (dead load), or permitting traffic on a structure (live load), etc., the Contractor shall determine the current concrete strength by a strength test and submit his proposed procedure to the Contract Administrator. The Contractor shall only proceed with the written acceptance of the Contract Administrator.

E14.9 Measurement and Payment

E14.9.1 Structural Concrete

(a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Items of Work:

(i) Supply and Place Structural Concrete

- Pier Modifications; and
- Drainage Channel.

(c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Place Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

## E15. FORCE MAIN STRUCTURAL STEEL SUPPORT SYSTEM

E15.1 Description

(a) This Specification shall cover all operations related to the supply, fabrication, transportation, handling and erection, and all incidental structural steel elements, components and fasteners for the structural support assembly of the Baltimore force main pipe crossing the St. Vital Bridge, as herein specified.

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

E15.2 Scope of Work

E15.2.1 The Work under this Specification shall include but not be limited to:

(a) Supplying all structural steel, high strength bolts, nuts and washers;

(b) Preparing and cleaning all existing steel girder and faying surfaces;

(c) Installing the force main structural steel support system;

(d) Increasing existing openings in pier diaphragms to accommodate new force main pipe;

(e) Completing any necessary galvanizing touch-ups; and

(f) Coating steel girders and structural steel support system where specified.

E15.3 Reference Standards, Specifications, and Drawings

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

(i) ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;

(ii) ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts;

(iii) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(iv) ASTM F436 – Standard Specification for Hardened Steel Washers Inch and Metric Dimensions;

(v) ASTM F2329 – Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners;

(vi) ASTM F3125 – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150

ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength;

(vii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(viii) CAN/CSA G164 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(ix) CAN/CSA W47.1 – Fusion Welding of Steel Company Certification;

(x) CAN/CSA W48.1 – Carbon Steel Covered Electrodes for Shielded Metal Arc Welding;

(xi) CAN/CSA W48.3 – Low Alloy Steel Covered Electrodes for Shielded Metal Arc Welding;

(xii) CAN/CSA W48.4 – Solid Carbon Steel Filler Metals for Gas Shielded Arc Welding;

(xiii) CAN/CSA W48.5 – Carbon Steel Electrodes for Flux- and Metal-Cored Arc Welding;

(xiv) CAN/CSA W48.6 – Fluxes and Carbon Steel Electrodes for Submerged Arc Welding;

(xv) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding);

(xvi) CAN/CSA W178.1 – Welding Inspection Organizations Company Certification;

(xvii) CAN/CSA W178.2 – Certification of Welding Inspectors;

(xviii) SSPC SP1 – Solvent Cleaning; and

(xix) SSPC SP 6 – Commercial Blast Cleaning.

(b) The following Specifications

(i) D34– Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E12 – Removal of Existing Aerial Supported Force Main Pipe;

(iv) E14 – Structural Concrete; and

(v) E16 – Force Main Across Bridge.

E15.4 Submittals

E15.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including submission of a plan outlining the Contractor's proposed methods and sequence of operations for installation of the structural steel support system.

E15.4.2 Shop Drawings

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled fabrication, an as-built survey of the existing structural support system. This data will be used to develop shop drawings for the new structural steel support system.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, all shop drawings, and product data.

(c) The Shop Drawings shall clearly show shapes, weights, dimensions, details, connections, bolt holes, and accessories.

(d) The Contractor shall identify all areas requiring special surface treatment.

(e) Repair procedures, if required, for repair of fabricating defects or other damage to structural steel components.

(f) Proposed procedures and methodology for increasing the size of the openings through the pier diaphragms, so as not to damage the existing structure, or any bridge components or elements.

E15.4.3 Mill Test Certificates

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to delivery, mill certificates.

(b) Where mill test certificates for any steel originates from a mill outside Canada or the United States of America, the Contractor shall have the information of the mill test certificate verified by independent testing by a Canadian laboratory. The laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of test required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date, and the signature of an authorized office of the Canadian laboratory.

(c) The Contractor shall provide proof demonstrating that the bolts, nuts, and washers meet the chemical composition, mechanical properties, dimensions, workmanship, and head burst as required by ASTM F3125, A563, and F436. Verification of the acceptability of assemblage of zinc coated bolts shall be provided with the bolts, nuts, and washers delivered to the Site and shall be submitted to the Contact Administrator.

(d) For bolts supplied from a Manufacturer outside Canada or the United States of America, the above information shall be independently verified by testing by a Canadian laboratory as outlined in E15.4.3(b).

E15.4.4 Welding Certification

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, proof of qualification for the Contractor and the welders conducting the Work.

(b) The Contractor shall produce evidence that all welders to be employed on the Work are currently qualified by the authority having jurisdiction in the procedures in which they are to be employed on the Work.

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

E15.4.5 Weld Procedures

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, the welding procedures to be employed in the Work. The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, welding equipment, and any special requirements.

E15.4.6 Girder Coating System

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site a sample of the coating system to demonstrate that the color of the system matches the look of the existing girders. Acceptance of the final color will be at the discretion of the Contract Administrator.

E15.5 Materials

E15.5.1 General

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

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

E15.5.2 Structural Steel

(a) All structural steel shall conform to the requirements of CAN/CSA G40.21, Grade 300W.

E15.5.3 High Strength Bolts, Nuts and Washers

(a) High strength bolts shall conform to the requirements of ASTM Specification F3125, Grade A325, Type 1 heavy hex head. Nuts shall conform to the requirements of ASTM Specification A563, Type 1. Washers shall conform to the requirements of ASTM Specification F436, Type 1. Pneumatic torque wrench with Skidmore-Wilhelm calibration method shall be used for installation.

(b) High Strength bolts, nuts, and washers shall be hot-dip galvanized to conform to the requirements of ASTM F2329.

E15.5.4 Welding Consumables

(a) Welding consumables for all processes shall be certified by the manufacturer as complying with the requirements of CAN/CSA W59 and the following specifications:

(i) Manual, Shielded Metal Arc Welding (SMAW):

- All electrodes for manual, shielded metal arc welding shall conform to the requirements of CAN/CSA W48.1, classification E7018 for single pass tack welds, and CAN/CSA W48.3, classification numbers E8016-B1 or E8016-C3 for final welds.

(ii) Gas Metal Arc Welding:

- All electrodes used in the gas, metal arc-welding process shall be composite electrodes that conform to the requirements of CAN/CSA W48.4, classification E70-T5.
- All electrodes used in the flux-cored, arc welding process shall conform to the requirements of CAN/CSA W48.5, classification F72-EM12K.

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

(iv) Submerged Arc Welding (SAW Equipment):

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

(v) All electrodes, wires and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -30°C as outlined in the various codes mentioned above.

(b) In multiple pass welds, the weld may be deposited such that at least two layers on all surfaces and edges are deposited with one of the filler metals listed above for each particular welding process, provided the underlying layers are deposited with one of the filler metals specified in CAN/CSA W59.

E15.5.5 Hot-Dip Galvanizing

(a) All structural elements shall be hot dip galvanized.

(b) All designated steel items supplied under this Specification shall be hot-dip galvanized in accordance with the requirements of CAN/CSA G164 and ASTM A123 to a net retention of 610 g/m$^2$.

E15.5.6 Galvanizing Touch-Up

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with the requirements of ASTM A780. Approved products are Galvalloy as Metalloy Products Company, and Welco Gal-Viz Galvanizing Alloy.

E15.5.7 Girder Coating System

(a) The coating system shall be the following three coat system as manufactured by the Carboline Company, or equivalent as approved by the Contract Administrator in accordance with B7, “Substitutes”.

(b) The colour shall match the existing girders.

E15.5.8 Handling and Storage of Materials

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

(b) Material to be stored shall stored above the ground on platforms, skids or other supports.

(c) The Contractor shall handle and store structural steel in a manner that ensures it is not damaged or contaminated with dirt or other materials and is properly drained.

(d) If, in the opinion of the Contract Administrator, any materials, in whole or in part, do not conform to the Specifications detailed herein or are found to 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.

E15.6 Equipment

E15.6.1 General

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

E15.7 Construction Methods

E15.7.1 General

(a) The Contractor undertake all operations to prevent damage of existing structures to remain.

(b) If the safety of the structure and/or existing structures or services appears to be endangered during structural removal operations, the Contractor shall cease operations and notify the Contract Administrator immediately.

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

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

(e) Traffic and pedestrian control shall conform to the requirements of E4, “Traffic Control and Management” and E5 “Pedestrian Protection”.

(f) No products are to find their way into the watercourse. The Contractor shall take all necessary precautions to ensure that material do not fall onto any roadways or sidewalks during removal operations.

(g) In no case will the Contractor be permitted to use equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.

E15.7.2 Fabrication

(a) General

(i) Except as otherwise specified herein, steelwork shall be fabricated in accordance with the requirements of CAN/CSA W59.

(ii) All shop welding and provision of holes shall be completed prior to hot-dip galvanizing of structural steel exterior and interior surfaces. Members shall be cleaned of any weld slag or other debris prior to preparation for hot-dip galvanizing.

(iii) Adequate venting and drainage holes shall be provided in enclosed sections to be hot-dip galvanized, and where shown on the Drawings.

(b) Edge Preparation for Welding

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

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

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

(iii) Edges may be prepared by oxygen cutting, providing a smooth and regular surface free from cracks and notches is secured, and providing that an accurate profile is secured by the use of a mechanical guide. Freehand cutting shall be done only where acceptable to the Contract Administrator.

(iv) All flange plates prepared by flame cutting shall be preheated in accordance with E15.7.1(g), “Preheat and Interpass Temperatures”.

(v) In all oxygen cutting, the cutting flame shall be so adjusted and manipulated as to avoid cutting beyond (inside) the prescribed lines. Roughness of cut surfaces shall not be greater than that defined by the United States Standards Institute surface roughness value of 1,000 (USAI B46.1, Surface Texture). Roughness exceeding this value shall be removed by machining or grinding. Occasional gouges will be tolerated only at the discretion of the Contract Administrator and shall be repaired in accordance with his instruction.

(c) Edge Preparation (Nonwelded Edges)

(i) Steel may be cut to size by sawing, shearing, flame-cutting or machining. All steel after cutting shall be marked by a method agreed to by the Contract Administrator so that its Specification may be immediately identified.

(ii) Sheared edges of plates more than 16 mm in thickness shall be planed to a depth of 6 mm.

(iii) Edges of flame cut flange plates shall be ground to a radius of 2 mm. Re-entrant cuts shall be filleted to a radius of not less than 19 mm.

(d) Bolt Holes

(i) All holes for high strength bolts shall be either sub-punched to a maximum of 22 mm and reamed, or drilled, and shall be of a nominal diameter not more than 2 mm in excess of the nominal bolt diameter.

(ii) Reamed holes shall be cylindrical and perpendicular to the member. Where practicable reamers shall be directed by mechanical means. Reaming shall be done with twist drills.

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

(iv) Poor matching of holes may be cause for rejection.

(e) Marking

(i) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system.

(f) Assembly

(i) The shop assembly of the various components of the weldments shall be executed in accordance with the requirements of CAN/CSA W59.

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

(iii) Tack welds shall be made with 4 mm maximum size electrodes and shall be subject to the preheat requirements of E15.7.1(g), “Preheat and Interpass Temperatures”.

(g) Preheat and Interpass Temperatures

(i) No welding shall be done when the ambient temperature is lower than 20°C.

(ii) At temperatures below 0°C, the steel shall be preheated to a temperature of at least 10°C in excess of that stipulated by E15.7.1(g)(v).

(iii) Preheat shall be applied to all steel to be welded so that the steel within 80 mm of the weld is heated to the temperature specified by E15.7.1(g)(v).

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

(v) For all welding processes, preheat and interpass temperatures shall be maintained during welding, at temperatures in accordance with the requirements of CAN/CSA W59.

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

(vii) Preheat requirements for tack welds shall be as stipulated above except that where single pass tack welds are used and are to be incorporated and consumed in a weld made by the submerged arc and the gas metal arc processes, preheat is unnecessary.

(h) Welding

(i) Welding shall be done by the manual, shielded metal arc, gas shielded metal arc, flux-cored arc, or submerged arc processes in accordance with the approved procedures and CAN/CSA W59.

(ii) All welding shall be done under cover and, in the case of gas metal arc welding or flux-cored arc welding, shall be done in an area free from wind or draft.

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

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

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

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

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

(vii) SAW machines may be used only when they are equipped with a mechanical control of travel speed.

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

(i) Weld Profiles

(i) Weld profiles shall meet the requirements of Clause 5.9 of CAN/CSA W59.

(j) High Strength Bolt Installation

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

(ii) Tensioning of bolts shall be done using the Turn of Nut Method described in E15.7.6, “Turn of Nut Tightening”.

E15.7.3 Shipping

(a) Structural members shall be loaded in such a manner that they can be transported and unloaded at their destination without being excessively stressed, deformed or otherwise damaged.

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

E15.7.4 Field Assembly

(a) The parts shall be accurately assembled as shown on the Drawings and any match marks shall be followed. Hammering which will injure or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

(b) Field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins) before final bolting. Fitting up bolts shall be the same nominal diameter as the high strength bolts, and cylindrical erection pins shall be 1 mm larger.

E15.7.5 Bolting

(a) ASTM F3125 high strength bolts shall be used for bolted connections. Bolts shall be sufficiently long to exclude threads from the shear plane.

(b) Prior to assembly, all joint surfaces, including those adjacent to bolt heads, nuts and washers, shall be free of loose scale, burrs, dirt, and foreign material.

(c) All bolted connections shall be slip critical connections.

(d) The faying surfaces of connections identified as slip-critical connections shall be prepared as follows and as shown on the Drawings:

(i) For clean mill scale, the surfaces shall be free of oil, paint, lacquer, or any other coating and then blast cleaned;

(ii) For coated surfaces other than galvanized, the surfaces shall be free of oil, lacquer, or other deleterious coatings; and

(iii) Hot dip galvanized surfaces shall be roughened after galvanizing by means of hand wire brushing. Power wire brushing is not permitted.

(e) This treatment shall apply to all areas within the bolt pattern and for a distance beyond the edge of the bolt hole that is the greater of 25 mm or the bolt diameter.

(f) Pretensioned bolts shall be tightened to at least 70% of the specified minimum tensile strength.

(g) Bolts shall not be reused once they have been fully tightened. Bolts that have not been fully tensioned may be reused up to two times, providing that proper control on the number of reuses can be established. Retightening of bolts loosened due to the tightening of adjacent bolts is not considered to be a reuse.

(h) Hardened washers shall be provided under the head and the nut of each bolt for a total of two (2) washers per bolt. Hardened washers are required under the nut and bolt head adjacent to joint surfaces containing oversize or slotted holes. When used with slotted holes the washers shall be at least 8 mm thick and of sufficient size to overlap the hole by 5 mm all around.

E15.7.6 Turn of Nut Tightening

(a) Support members shall be fit up and all bolts snug tightened, with subsequent tightening taking place by turn of nut method.

(b) After aligning the holes in a joint with a properly sized drift pin, sufficient bolts shall be placed and brought to a snug-tight condition to ensure that the parts of the joint are brought into full contact with each other.

(c) Following the initial snugging operation, bolts shall be placed in any remaining open holes and brought to snug-tightness. Resnugging may be necessary in large joints.

(d) When all bolts are snug-tight, each bolt in the joint shall be tightened additionally by the applicable amount of relative rotation given in Table 3, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench. The bolt and nut shall be matched marked to enable the amount of relative rotation to be determined.

**TABLE E15.1**
**NUT ROTATION FROM SNUG TIGHT CONDITION**

| Outer Face Alignment of Bolted Parts | Bolt Length $L_b$ | Turn From Snug |
|---|---|---|
| Both faces normal to bolt axis or, one face normal other face sloped 1.2 max | $L_b \leq 4\ d_b$ | 1/3 |
| | $4\ d_b \leq L_b \leq 8\ d_b$ | ½ |
| | $L_b \geq 8\ d_b$ | 2/3 |
| Both faces sloped 1:20 from normal bolt axis – bevelled washers not used. | All Bolt Lengths | 3/4 |

**Notes:**
1. Bolt diameter is indicated as $d_b$.
2. Tolerance on rotation is 30 degrees over/under.
3. Table applies to coarse-thread. Heavy-hex structural bolts of all sizes and lengths used with heavy-hex semi finished nuts.
4. Bolt length is measured from the underside of the head to the extreme end point.

E15.7.7 Coating of Structural Steel

(a) Before any blast cleaning operations or coating applications commence, the following surface cleaning operations shall be undertaken on all structural steel designated to receive coating:

(i) All oil and grease shall be removed manually with solvent cleaning as per SSPC Specification SP1; and

(ii) Water used for high pressure water washing shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

(b) Prior to high pressure water washing all organic materials such as bird droppings, nests and other non-structural obstructions or pollutants attached to the steel are to be removed by hand cleaning operations.

(c) All faying surfaces of new and existing structural steel at bolted connection locations shall be surface prepared and prime coated. This includes faying surfaces of the existing girder web to receive new bolted connections.

(d) The Contractor shall prepare the structural steel immediately prior to, by blast cleaning in accordance with SSPC-SP6. No rust scale shall remain in the designated areas. Should the Contractor has an alternative method to be presented, this method shall be presented by way of formal submission, including proposed means and methods, for review by the Contract Administrator.

(e) All faying surfaces shall be cleaned by blasting. Girder faying surfaces shall receive inorganic zinc primer with a Class A or Class B slip coefficient applied and allowed to cure in accordance with Manufacturer instructions prior to fit up of bolted connections.

(f) Coating system application operations shall be coordinated, sequenced and scheduled to commence after structural steel installation is completed.

(g) Coating of Structural Steel must take place in accordance to the specified Manufacturer's recommendations.

E15.7.8 Damage to Girders

(a) The girders shall be carefully protected during installation of the structural steel The Contractor shall repair any such damage to the satisfaction of the Contract Administrator.

(b) The erection of structural steel shall be done so that there shall be no forces applied to cause overstressing of the girders.

E15.7.9 Welding Consumables

(a) All electrodes having low hydrogen coverings shall be dried for at least 2 hours between 230°C and 260°C, before they are used. Electrodes shall be stored immediately after drying in storage ovens held at a temperature of at least 120°C. Electrodes that are not used within four (4) hours after removal from a drying or storage oven shall be redried before use. Electrodes that have been wet shall not be used.

(b) Electrode wire used in SAW and FCAW welding shall be stored in the original container at room temperature and kept free of moisture, oil, dirt or other contaminators.

(c) Flux used for submerged arc welding shall be dry and free of contamination from dirt, mill scale, oil, or other foreign material. Fused flux shall not be used on the work.

(d) Gas for FCAW welding shall be stored in marked steel bottles and shall not be subjected to temperatures in excess of 50°C nor temperatures of less than 0°C.

E15.7.10 Galvanizing Touch-up Procedure

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

(b) Surfaces to receive field-applied galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.

E15.7.11 Force Main Openings in Pier Diaphragms

(a) Existing force main openings in pier diaphragms shall be increased in size to 650 mm at each of Piers 3, 4, 5, and 6.

(b) Openings shall be increased by way of cutting and/or grinding. The Contractor shall propose methods for undertaking this work in a way that the existing pier diaphragms are not damaged in any way.

(c) The Contractor shall undertake operations and shall protect all adjacent bridge components and elements when openings are increased in size.

(d) Modifications to concrete piers shall be completed prior to the installation of the force main pipe.

E15.8 Quality Control

E15.8.1 Inspection

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

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

E15.8.2 Access

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

E15.8.3 Testing

(a) All welds shall be visually inspected. The Contractor shall submit all Quality Control records to the Contract Administrator.

(b) Magnetic Particle Inspection shall be performed on 20% of all welds.

(c) Welds found to be inadequate and unsatisfactory shall be repaired in accordance with CAN/CSA W59 and retested.

E15.9 Measurement and Payment

E15.9.1 Force Main Structural Steel Support System

(a) The supply and installation of force main structural support system shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, “Supply and Install Force Main Structural Steel Support System”, performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

## E16. FORCE MAIN ACROSS BRIDGE

E16.1 Description

(a) This Specification shall apply to all operations relating to the Work necessary for the supply, installation, examination, inspection, flushing and testing of the Baltimore Force Main across the St. Vital Twin Bridge – Northbound Structure, including the coordination of the supply and delivery of the pre-purchased force main line pipe spools.

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

E16.2 Scope of Work

(a) The Work under this Specification shall involve:

(i) Coordinating the delivery, off-loading, handling and storage of the pre-purchased force main line pipe spools with the Contractor of Bid Opportunity 799-2020 – Supply and Delivery of Force Main Pipe;

(ii) Supplying, handling and storing all materials required for a complete installation of the force main (pipe, fittings, appurtenances, support/guide components, expansion joints, pipe insulation, valves, etc.);

(iii) Installing all materials required for a complete installation of the force main;

(iv) Examining, flushing and testing the force main installation;

(v) Providing an installation Guarantee for the new force main.

E16.3 Reference Standards, Specifications, and Drawings

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

(i) ANSI B1.1 – Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms);

(ii) ASME B1.20.1 – Pipe Threads, General Purpose, Inch;

(iii) ANSI B16.5 – Standard Specification for Forged or Rolled Alloy and Stainless Steel;

(iv) ANSI B16.21 – Non-Metallic Flat Gaskets for Pipe Flanges;

(v) ANSI/ASME B16.5 – Pipe Flanges and Flanged Fittings;

(vi) ASME B16.9 – Factory-Made Wrought Buttwelding Fittings;

(vii) ASME B16.34 – Valves - Flanged, Threaded, and Welding End;

(viii) ANSI B18.2 – Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series);

(ix) ASME B31.3 – Process Piping;

(x) ASTM A182 – Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service;

(xi) ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications;

(xii) ASTM A194 – Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both;

(xiii) ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes;

(xiv) ASTM A351 – Standard Specification for Castings, Austenitic, for Pressure-Containing Parts;

(xv) ASTM A403 – Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings;

(xvi) ASTM A536 – Standard Specification for Ductile Iron Castings;

(xvii) ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus;

(xviii) ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics;

(xix) ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics;

(xx) ASTM D6226 – Standard Test Method for Open Cell Content of Rigid Cellular Plastics;

(xxi) AWWA C110/A21.10 – American National Standard for Ductile-Iron and Gray-Iron Fittings for Water;

(xxii) AWWA C116/A21.16 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings;

(xxiii) AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings for Water Service;

(xxiv) AWWA C213 – Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines; and

(xxv) CSA W117.2 – Safety in Welding, Cutting, and Allied Processes.

(b) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 2125 – Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water Services;

(c) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E12 – Removal of Existing Aerial Supported Force Main Pipe;

(iv) E15 – Force Main Structural Steel Support System; and

(v) E19 – Commissioning of Force Main.

(d) Bid Opportunity 799-2020 – Supply and Delivery of Force Main Pipe.

E16.4 Submittals

E16.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including submission of a plan outlining the Contractor's proposed methods and sequence of operations for installation of the force main pipe across the bridge.

E16.4.2 Shop Drawings

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the commencement of any scheduled Work on the Site, all shop drawings, product data, and mill certificates for materials, components and systems.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least fifteen (15) Business Days prior to the commencement of any scheduled Work on the Site, all wiring diagrams for the Work.

(c) The Contractor shall mark each page submitted to clearly identify the specific product, components and data applicable to the supply of the material. Inapplicable information shall not be included in the submission.

(d) The Contractor shall supplement product data with drawings, as required, to illustrate relations of component parts of systems.

E16.4.3 Welding Certification

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, proof of qualification for the Contractor and the welders conducting the Work.

(b) The Contractor shall produce evidence that all welders to be employed on the Work are currently qualified by the authority having jurisdiction in the procedures in which they are to be employed on the Work.

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

E16.4.4 Weld Procedures

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, the welding procedures to be employed in the Work. The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements,

amperage and voltage requirements, speed, polarity, welding equipment, and any special requirements.

E16.5 Materials

E16.5.1 General

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

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

E16.5.2 Supply of Force Main Pipe

(a) The force main line pipe will be supplied under Bid Opportunity 799-2020 – Supply and Delivery of Force Main Pipe. This Contract will include the supply of NPS 18 (450 Dia.) stainless steel pipe in 6,096 mm lengths with ends beveled for butt joint arc welding, factory applied rigid polyurethane foam insulation, galvanized steel outer jacket for the horizontal piping, and high density polyethylene (HDPE) outer jacket for the vertical end piping. More specifically:

(i) Force main line pipe shall be Schedule 80S (0.500 in. wall thickness), seamless, stainless steel pipe conforming to the requirements of ASTM A312 Grade TP304L.

(ii) Insulation shall be factory applied rigid polyurethane foam:

- 76.2 mm (3 in.) thick, 35 to 46 kg/m$^3$ density when tested in accordance with ASTM D1622;
- Minimum 90% closed cell content when tested in accordance with ASTM D6226;
- Maximum 4% by volume water absorption when tested in accordance with ASTM D2842; and
- 0.020 to 0.026 W/m-ºC thermal conductivity when tested in accordance with ASTM C518.

(iii) Outer jacket shall be, as indicated, either:

- Minimum 22 Gauge, lock forming quality, galvanized sheet steel, with spiral lock seam; or
- Minimum 3.81 mm thick, UV inhibited, black, continuously extruded high density polyethylene with properties suited to ambient temperatures ranging from minus (-) 40 to plus (+) 40 degrees Celsius (ºC), and tested and certified for cold weather handling, installation and operation to minus (-) 55 degrees Celsius (ºC).

(iv) System compressive strength with either jacket and with a pipe clamp (Anvil Fig. 432) shall be adequate for a support force from a pipe roll stand (Anvil Fig. 271) of up to 7,050 lbs.

(b) Goods under of Bid Opportunity 799-2020 shall be delivered by July 15, 2021, with delivery to be specified by the Contract Administrator. The Contractor will coordinate delivery of these materials with the Contract Administrator and fabricator and will confirm location of delivery of materials. Upon delivery of materials, the Contractor will assume responsibility for these materials and will be responsible for offloading and storage of materials until piping is fully installed.

(c) Total Performance of Bid Opportunity 799-2020 is August 15, 2021. Should any materials not be delivered by this date, the Contractor shall be compensated at a rate of five hundred dollars ($500) per day.

E16.5.3 Force Main Pipe (Other than Line Pipe), Pipe Fittings and Appurtenances

(a) Force main pipe shall be Schedule 80S, seamless, stainless steel pipe to ASTM A312 Grade TP304L.

(b) Force main fittings shall be Schedule 80S, seamless, stainless steel butt welding fittings to ASTM A403 Grade WP304L, and shall conform to ASME B16.9. Additionally, the crotch thickness and radius of tees shall meet the requirements in Table D300 of ASME B31.3.

(c) Force main pipe flanges shall be the welding neck type (with bore to match inside diameter of pipe) of forged stainless steel to ASTM A182 Grade F304L, and shall conform to ANSI B16.5 Class 150 with flat or raised face as required to match mating flange.

(d) Force main blind flanges shall be forged stainless steel to ASTM A182 Grade F304L and shall conform to ANSI B16.5 Class 150 with raised face.

(e) Flange bolt-studs shall be alloy steel to ASTM A193 Grade B7, with full-length threads to ANSI B1.1 Class 2A.

(f) Flange nuts shall be alloy steel to ASTM A194 Grade 2H, heavy hex, Class 2 fit, to ANSI B18.2, with threads to ANSI B1.1 Class 2B.

(g) Flange gaskets shall be Class 150, to ANSI B16.21, flat ring, non-metallic, 1.6 mm thick.

E16.5.4 Force Main Pipe Insulation

(a) Insulate, wherever the factory applied insulation is absent (i.e. joints, fittings, fabricated pipe sections, appurtenances, expansion joints, valves, etc.), with snug-fitting pre-fabricated half-shells of rigid polyurethane foam consistent with that on the factory insulated pipe and having a polymer coating. Field-cover half-shells with a water and vapour proof heat shrink wrap that overlaps adjoining surfaces 150 mm minimum.

(b) Where the outer jacket on the factory insulated pipe is galvanized sheet steel provide pre-fabricated galvanized sheet steel outer protective jacketing consistent with that on the pipe for field installation over the heat shrink wrap. Secure jacketing with stainless steel bands and band-it clips. Overlap adjoining surfaces minimum 300 mm with longitudinal overlaps field positioned to shed water.

(c) Where the outer jacket on the factory insulated pipe is polyethylene provide outer protective jacketing consistent with that on the pipe and watertight to 6.25 m (20.5 ft.) submergence for field installation over the heat shrink wrap. Extend the latter to cover the flanged connections of the stainless steel pipe to the underground HDPE pipe.

(d) Accommodate linear and angular displacements at expansion joints.

(e) Provide removeable insulation where indicated on the drawings.

(f) All materials shall be Urecon supply.

E16.5.5 Expansion Joints

(a) Expansion joints shall be the flexible type, complete with flanged ball-and-socket ends and an expansion/contraction fitting.

(b) Expansion joints shall be 72.8 in. +/- 4 in. in length and have up to 15 degrees deflection per ball.

(c) Expansion joints shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and AWWA C153/A21.53 and shall have Class 150 flanges conforming to the dimensional requirements of AWWA C110/A21.10.

(d) Expansion joints shall be rated for 2.4 MPa(g) (350 psig) working water pressure.

(e) Wetted (interior) surfaces of expansion joints shall be coated with minimum 15 mils fusion bonded epoxy to AWWA C213, while exterior surfaces shall be coated with minimum 6 mils fusion bonded epoxy to AWWA C116/A21.16.

(f) Expansion joints shall be EBAA Iron Inc. FLEX-TEND model 418F20.

E16.5.6 Ball Valves

(a) Ball valves shall be 3-piece construction, full port, Class 600 to ASME B16.34, with cast stainless steel body to ASTM A351-CF8M, NPT end connections to ASME B1.20.1, type 316 stainless steel ball and blowout-proof stem, PTFE packing and gaskets, and 2-1/4 in. stem extension.

(b) Ball valves shall be Apollo Valves model 86B-108-01-04.

E16.5.7 Handling and Storage of Force Main Materials

(a) Force main materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Provide covered storage for all materials (including the pre-purchased pre-insulated and un-insulated pipe spools) to keep off any rain or snow. Materials shall also not be placed directly on the ground. Timber pallets shall be placed beneath all materials to keep them off the ground and free from any dirt, mud or snow.

(b) Transport, store and handle pre-insulated pipe spools with care in order to prevent damage to the insulation and/or protective jacket. If damage occurs notify the Contract Administrator. All handling of pre-insulated as well as un-insulated pipe spools shall be with fabric slings.

(c) If, in the opinion of the Contract Administrator, any materials, in whole or in part, do not conform to the Specifications detailed herein or are found to have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

(d) Fabricated pipe sections being stored or shipped shall have wooden plugs securely installed in each pipe end (except for ends with flanges) in order to prevent the ends from being banged or bent out of round.

(e) Fabricated pipe sections shall be stored in a manner that will prevent them from being damaged or covered with other material.

E16.6 Equipment

E16.6.1 General

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

E16.7 Construction Methods

E16.7.1 Force Main Installation

(a) The Contractor shall review the accepted shop drawings from Bid Opportunity 799-2020 – Supply and Delivery of Force Main Pipe.

(b) When received, the force main line pipe shall be unloaded and stored in accordance with the Manufacturer's recommendations and as specified in B1.5.7 – Handling and Storage of Force Main Materials.

(c) The Contractor shall install the force main in the locations indicated on the Drawings.

(d) All work shall be completed in accordance with best trade practices.

(e) All handling and temporary support of pre-insulated as well as un-insulated pipe spools shall be with fabric slings.

(f) All proprietary manufactured products shall be installed in accordance with the Manufacturer's printed installation instructions and as indicated.

(g) Prior to placing the pre-insulated pipe spools on the pipe roll stands, align the tops of the rollers so that the force main pipe will lie straight without sags or dips and will be equally supported by each pipe roll stand. Adjust the elevations of the pipe support beams under the pipe roll stands as required to achieve alignment.

(h) Welded joints in the force main line pipe shall be located well away from the pipe roll stands.

(i) Pipe clamps (Anvil Fig. 432) shall be located so that they will be centred on the pipe roll stands when the bridge is at 0 degrees Celsius ($^0$C) and the force main is at plus (+) 12 degrees Celsius ($^0$C).

(j) Protect openings against entry of foreign material. Remove foreign material prior to assembly.

(k) Flange faces shall be perpendicular to the centreline of the pipe.

(l) Flange bolts shall be tightened evenly with a torque wrench and shall expose two threads minimum past the nut when tight.

(m) Expansion joints shall be installed complete with insulating spools on all flange bolts (for electrical isolation of the joints) and a bonding jumper (for electrical continuity of the stainless steel piping).

(n) Threaded joints shall be made with Teflon tape. The tape shall be applied so that it will tighten when the joint is made. The tape wrapping shall start approximately two threads from the end of the pipe.

(o) Whenever Teflon tape joints are broken, all traces of the old tape shall be removed before applying new tape and reassembling the joint.

(p) Welds shall not be concealed until they have been examined, tested and approved by the Inspector, and accepted by the Contract Administrator.

(q) Insulate joints (welded, flanged, expansion, etc.) and valves only after approval by the Inspector, and acceptance by the Contract Administrator, of the hydrostatic leakage test.

E16.7.2 Preparation for Welding

(a) The ends of pipes to be jointed shall be prepared by machining or grinding, and all burrs shall be removed.

(b) All equipment used in welding preparation shall be covered or faced with material that will prevent mild steel particles from contaminating the surfaces and joints of the stainless steel material.

(c) All items used to prepare welded joints, such as grounding clamps, wire brushes, steel wool, chisels, files and peen hammers, shall be made from stainless steel and shall be marked ‘STAINLESS STEEL’.

(d) Whenever the use of grinding wheels is required, only those which have been used solely for stainless steel shall be permitted.

(e) Cutting shall not be done with electric-arc or special gas cutting equipment.

(f) Pre-fabricated pipe sections that require beveled ends shall have the field joints beveled in the shop.

(g) All metal that is to be fused during welding shall be clean of lubricants, grease, paint, filings, cuttings, and any other foreign material. Cleaning may be done only with alcohol or acetone. (Do not use chlorinated solvents.)

(h) Joint alignment shall only be done with mechanical devices. Under no circumstances shall heat be used in the alignment of joints

E16.7.3 Welding

(a) Welding safety requirements shall be in accordance with CSA W117.2.

(b) Welding shall be in accordance with ASME B31.3.

(c) Qualification of welding procedures and of the performance of welders shall conform to the requirements of ASME B31.3, Section IX of the ASME Boiler and Pressure Vessel Code, and the provincial authority having jurisdiction.

(d) Welding procedures shall be registered in accordance with CSA B51 and shall be stamped and signed by a Professional Engineer registered in the Province of Manitoba.

(e) Welding procedures shall be in accordance with E16.4.4, “Weld Procedures”.

(f) Contractor shall conform to reviewed welding procedures.

(g) Welders shall be qualified and licensed and shall possess certificate for each procedure performed from provincial authority having jurisdiction. Certifications shall be submitted in accordance with B1.4.3 – Welding Certification.

(h) All welds shall have complete joint penetration and shall be made using ER308L filler metal.

(i) The inside of all butt welds shall be smooth and free of projections or crevices.

(j) The tungsten inert gas (TIG) shielded arc welding process, with shielding gas protection on the underside of the weld, shall be used for welding stainless steel.

(k) Use equipment (inverter-based TIG machines) and procedures to reduce average amperage and heat input and the amount of time the weld spends in the sensitizing temperature zone (approximately 400 to 900 degrees Celsius ($^0$C)).

(l) The temperature of the welding area shall be kept below the sensitizing temperature zone. This may be accomplished on field welds by following the weld bead as closely as possible with a water-soaked heavy felt cloth. Copper chill bars, if used, shall be nickel plated to prevent copper pickup.

(m) All materials shall be dry and completely protected from the wind and weather during a welding operation.

(n) All scale, oxides and discoloration shall be removed from the pipe and welds by the application of a pickling paste followed by a thorough neutralizing wash to remove the paste from the metal surfaces.

(o) Welds that do not meet test and inspection requirements shall be removed by grinding or machining.

(p) Removed welds shall be repaired and re-tested. The cost of removal, repair and re-test shall be paid by the Contractor. No removal, repair or re-test of a weld shall be made until agreed to by the Contract Administrator.

## E16.8 Quality Control

### E16.8.1 Inspection

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

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

(c) 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.

### E16.8.2 Inspection and Examination

(a) Inspection and examination of the force main shall be in accordance with ASME B31.3.

(b) The Contractor shall cooperate fully with the Contract Administrator’s and City’s Inspectors and Inspector’s delegates.

(c) Examination applies to quality control functions performed by the Contractor.

(d) Inspection does not relieve the Contractor of the responsibility for: a) providing materials, components and workmanship in accordance with the requirements of ASME B31.3 and of the engineering design; b) performing all required examinations; and c) preparing suitable records of examinations and tests for the Inspector's use.

(e) The force main shall be examined to the extent and with the acceptance criteria specified in ASME B31.3 for Normal Fluid Service, with the following exceptions:

(i) 100 percent of fabrication shall be visually examined;

(ii) All circumferential butt welds shall be examined by 100 percent radiography;

(iii) Required radiographic examination shall be extended to include undercutting; and

(iv) The acceptable value limit for incomplete penetration and undercutting for circumferential butt welds shall be zero (no evident imperfection).

(f) Qualifications and certification of examination personnel shall be as required by ASME B31.3.

E16.8.3 Force Main Flushing and Hydrostatic Leak Testing

(a) The Contractor shall fill and flush the force main with potable water in accordance with CW 2125 as applicable, with adjustments as required for the particulars of the application (e.g. backflow preventer at the water supply source, etc.), and with the following exceptions:

(i) Flush the force main at a minimum velocity of 0.3 m/s with water supplied from hose connections to a hydrant or from a tanker truck having a pump; and

(ii) Flush for a sufficient length of time to completely exchange the pipe volume between the connection near the north riverbank bypass chamber and the outlet at Kingston Row.

(b) The Contractor shall hydrostatically leak test the force main with potable water in accordance with CW 2125 as applicable, with adjustments as required for the particulars of the application (e.g. backflow preventer at the water supply source, etc.), and with the following exceptions:

(i) The test pressure shall be 413.7 kPa(g) (60 psig) for a minimum of 4 hours duration;

(ii) The leakage shall be zero – a visual examination of every joint (welded, flanged, expansion, threaded, etc.) along the force main during the test shall confirm that there are no leaks;

(iii) The pressure drop during the test shall be negligible; and

(iv) The pressure during the test shall not exceed 413.7 kPa(g) (60 psig).

(c) Repair or replace all deficiencies and re-test. The Contract Administrator shall determine whether repair or replacement is required. Submit repair/replacement procedures to the Contract Administrator for review and acceptance.

(d) Disinfection of the force main is not required

E16.8.4 Installation Guarantee

(a) The Contractor shall provide a written guarantee that the installation of the force main assembly has been appropriately installed and will perform satisfactorily for a period of five (5) years from the date of Substantial Performance.

E16.9 Measurement and Payment

E16.9.1 Force Main Pipe

(a) Coordinating delivery and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Install Force Main Pipe", unless otherwise

noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

(b) Any necessary engineering and adjustment shall be considered incidental to the Work.

(c) Upon completion of force main installation, the Contractor shall receive a partial payment of fifty (50%) percent. Upon completion of inspection, commissioning, and certification of the installed force main assembly, the balance of the partial payment of fifty (50%) percent will be made.

(d) Installation of force main pipe shall be paid for at the Contract Unit Price per unit for "Items of Work" listed here below, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work:

(e) Items of Work:

(i) Install Force Main Pipe

- Type 1;
- Type 2; and
- Type 3.

E16.9.2 Force Main Pipe Fittings and Appurtenances

(a) The supply and installation of force main pipe fittings and their appurtenances for shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, "Supply and Install Force Main Pipe Fittings and Appurtenances", performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

E16.9.3 Force Main Pipe Insulation

(a) The supply and installation of force main pipe insulation for shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, "Supply and Install Force Main Pipe Insulation", performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

E16.9.4 Expansion Joints

(a) The supply and installation of force main expansion joints for shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, "Supply and Install Expansion Joints", performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

E16.9.5 Ball Valves

(a) The supply and installation of force main ball valves for shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for, "Supply and Install Ball Valves", performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

## E17. FORCE MAIN CONNECTIONS AND RELATED WORKS

E17.1 Description

(a) This Specification shall apply to all operations relating to the work necessary for the supply and installation of buried pipe connections from the existing force main pipe to the replacement aerial force main, including drain manholes and piping and associated works.

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

E17.2 Scope of Work

(a) The Work to be done by the Contractor under this Specification shall involve:

(i) Installing the force main pipe, fittings, appurtenances and associated hardware;

(ii) Installing the force main drain pipe, including manholes, valves, thrust blocks, fittings and associated hardware.

E17.3 Reference Standards, Specifications, and Drawings

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

(i) AWWA C517 – Resilient-Seated Cast-Iron Eccentric Plug Valves;

(ii) AWWA C550 – Protective Interior Coatings for Valves and Hydrants;

(iii) AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 65 in. (100 mm through 1,650 mm), For Water Transmission and Distribution; and

(iv) AWWA C906 – Polyethylene (PE) Pressure Pipe and Fittings, 4 in. Through 65 in. (100 mm through 1,650 mm), For Waterworks.

(b) The latest versions of the following City of Winnipeg Standard Construction Specifications and Standard Detail (SD) drawings (available at:https://www.winnipeg.ca/matmgt/Spec/Default.stm)

(i) CW 2030 – Excavation Bedding and Backfill.

(ii) CW 2125 – Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water Services.

(iii) CW 2130 – Gravity Sewers.

(iv) CW 2145 – Sewer and Manhole Inspection; and

(v) CW 2160 – Concrete Underground Structures and Works.

The latest version of the City of Winnipeg Approved Product Standard for Underground Use, available at:
https://www.winnipeg.ca/finance/findata/matmgt/std_const_spec/current/Docs/Approved_Products_Underground_Works.pdf

(c) The following Specifications:

(i) D34 – Environmental Protection Program;

(ii) E11 – Exploration of Existing Utilities;

(iii) E16 – Force Main Across Bridge; and

(iv) E18 – Electrical and Controls.

E17.4 Submittals

E17.4.1 General

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

E17.4.2 Shop Drawings

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, shop drawings, product data and mill certificates for all materials, components and systems.

(b) The Contractor shall mark each page submitted to clearly identify the specific product, components and data applicable to the supply of the material. Inapplicable information shall not be included in the submission.

(c) The Contractor shall supplement product data with drawings, as required, to illustrate relations of component parts of systems.

## E17.5 Material

### E17.5.1 General

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

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

### E17.5.2 Force Main Pipe

(a) Pipe materials are as noted on the Drawings.

(b) 450 mm PVC force main pipe to be DR25 (pressure rating 690 kPa) to AWWA C900. Joints to be either flanged or bell and spigot type with joint harnesses.

(c) 500 mm HDPE force main pipe to be DR 11 with material designation PE4710 (pressure rating 690 kPa) to AWWA C906. Joints to other pipe materials to be flanged with epoxy coated ductile iron backup rings. Joints to HDPE pipe to be thermal butt fusion or electrofusion type.

### E17.5.3 Force Main Drain, Fittings and Appurtenances

(a) Pipe material as noted on the Drawings.

(b) 150 mm PVC drain to be DR18 to AWWA C900. Pipe and fittings to conform to City of Winnipeg Approved Products Standard CoW-WM-01 (Polyvinyl chloride PVC water main pipe), CoW-WM-02 (Fabricated polyvinyl chloride PVC water main fittings) and CoW-WM-03 (Injection moulded polyvinyl chloride PVC water main fittings). Joints to be flanged or bell and spigot type but noting that the location of certain joint types have been identified on the Drawings.

(c) 250 mm PVC drain to be SDR35 to City of Winnipeg Approved Products Standard CoW-SM-01. Fittings to be Injection moulded type to City of Winnipeg Approved Products Standard CoW-SM-08 (Injection moulded polyvinyl chloride PVC sewer main fittings).

(d) Force main wide range couplings to City of Winnipeg Approved Products Standard COW-WM-08 (Ductile iron water main couplings) may be used to accommodate deflected pipe closure connections.

### E17.5.4 Valves

(a) 450 mm force main outlet throttling valve to be full port, eccentric plug type valve for wastewater service, with cast iron body. Valve to conform to AWWA C517 Resilient-Seated Cast Iron Eccentric Plug Valves. Coating to be Fusion Bonded Epoxy to AWWA C550 or equal, rated for direct burial, and conforming to health requirements of NSF 61. Manual geared operator with 50 mm epoxy coated cast or ductile iron operating nut, to be housed in precast concrete valve chamber. Valve stem between valve and chamber to be housed within valve box as described below with cover removed, and stem penetration through bottom of valve chamber to include a steel or plastic escutcheon plate type stone disc, Valve to be Dezurik model PEF or equivalent.

(b) 150 mm drain valve gate valves to be cast iron or ductile iron resilient-seated gate valve with non-rising stems to City of Winnipeg Approved Products Standard CoW-WM-05 (Cast iron resilient-seated gate valves with non-rising stems) or CoW-WM-06 (Ductile iron resilient-seated gate valves with non-rising stems).

(c) Valve closure direction for force main drain valves to be counter-clockwise to close on north riverbank and clockwise to close on south riverbank, in accordance with SD-008.

(d) Valve boxes for force main drain valves to be grey or cast iron hinged lid marked 'S' (for sewer), bituminous-coated iron or steel upper casing and PVC lower casing, to City of Winnipeg Approved Products Standard Drawing AP-001 (Water Main Valve Box).

(e) Steel pipe valve stem extension to City of Winnipeg Approved Products Standard Drawing AP-003 (Water Main Valve Stem Extension).

E17.5.5 Bolts, Nuts, Washers and Tie Rods

(a) Bolts, Nuts, Washers and Tie Rods to be Stainless Steel to ASTM A240, type 304 or 304L.

E17.5.6 Precast Concrete Manholes

(a) Precast concrete manhole base sections, risers and reducers for dewatering manholes and throttling valve chamber to City of Winnipeg Approved Products Standard CoW-SM-14 (Precast concrete manholes, catch basins and components).

(b) Manhole joint gaskets to City of Winnipeg Approved Products Standard CoW-SM-16.

(c) Cast iron manhole frame and covers to City of Winnipeg Approved Products Standard Drawings AP-006 (Manhole Frame) and AP-007 (Solid Manhole Cover).

E17.5.7 Concrete for Thrust Blocks

(a) Concrete to CW 2160 - Concrete Underground Structures and Works, Table CW2160.1 Type B.

E17.5.8 Galvanic Zinc Anodes

(a) 10.9 kg galvanic zine anodes to include copper lead wire, zinc anode conforming to ASTM B418, cardboard tube and low-resistivity gypsum/bentonite backfill, to City of Winnipeg Approved Products Standard CoW-WM-10 (Galvanic zinc anodes).

(b) Lead wires to be No. 10 AWG 7 strand copper wire with white TWU minus 40C insulation.

E17.6 Construction Methods

E17.6.1 General

(a) All works shall be done in accordance with the City of Winnipeg Standard Construction Specifications.

E17.6.2 Buried Force Main Pipe Installation

(a) Establish locations and alignment of existing force mains near connections prior to commencing work in accordance with E11, Exploration of Existing Utilities.

(b) The proposed connection alignment will be used to establish the angle of the welded 90° bend at the bottom of the vertical riser pipes at the bridge piers.

(c) Purpose of HDPE pipe section near bridge piers is to provide for settlement and seasonal movement, without resorting to a flexible pipe coupling.

(d) Completion of the pipe connection closure may be made with an electrofusion coupling on the HDPE pipe sections or with a wide range coupling on the PVC pipe sections.

E17.6.3 Force Main Outlet Throttling Valve

(a) Install Eccentric Plug Valve and ring type thrust block on force main outlet into Kingston Row sewer as shown on drawing.

(b) Installed geared operator in a modified precast concrete shallow catch basin.

(c) Throttling valve to be set in fully open position following commissioning.

E17.6.4 Force Main Drain Installation

(a) Purpose of force main drain pipes and dewatering manholes is to facilitate dewatering of the force main by sewage trucks.

(b) Explore existing utilities prior to establishing final location of dewatering manholes and drain piping.

(c) Drain pipe shall be treated like a pressure pipe and require flanged or bell and spigot joints with joint harnesses and concrete thrust blocks as identified on the Drawings.

(d) Drain valves to be set in fully closed position following commissioning.

E17.6.5 Force Main Leakage Testing

(a) The Contractor shall flush and test the force main in accordance with CW 2125 and as specified in E16, Force Main Across Bridges.

(b) Disinfection of the new force main or drain pipes is not required.

(c) Leakage testing of force main drain pipes is not required.

(d) Install test plugs as necessary to complete leakage testing. The maximum section left out for closure shall not exceed 5.5 m.

(e) The throttling valve on the existing forcemain outlet into the Kingston Row sewer may be used to maintain the new force main filled with water for leakage testing.

(f) Further to E16, Force Main Across Bridge, the thermoplastic pipe sections shall be tested to a maximum pressure of 410 kPa (60 psi) and for a duration not to exceed two (2) hours. If repeated testing is required, ensure that pipes have a relaxation time of at least two (2) hours at zero pressure between tests.

E17.6.6 Operations and Maintenance Manual

(a) Compilation of information for inclusion in Operations and Maintenance Manual, as identified in E20, “Force Main Operations and Maintenance Manual”.

E17.6.7 Force Main Gravity Drain Inspection

(a) Inspect 150 mm and 250 mm gravity drains in accordance with CW 2145.

(b) Provide CCTV video and reports to Contract Administrator within 3 days of inspection. Do not complete surface restoration until Contract Administrator has completed review of inspection record and accepted the installation.

E17.7 Measurement and Payment

E17.7.1 Force Main Connection Piping and Drain

(a) The supply and installation of the force main connections to existing pipes, force main drains including dewatering manholes, valves, and associated works shall not be measured. These works shall be paid for at the Contract Lump Sum Prices for, “Supply and Install North Riverbank Connection Piping and Drain” and “Supply and Install South Riverbank Connection Piping and Drain”, performed in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(b) Upon completion of the connection and drain system installation, the Contractor shall receive a partial payment of fifty (50%) percent. Upon completion of inspection, commissioning, and certification of the installed force main assembly, the balance of the partial payment of fifty (50%) percent will be made.

## E18. ELECTRICAL AND CONTROLS

E18.1 Description

(a) This Specification shall cover all operations related to the supply and installation of electrical and controls equipment including pressure sensors, RTU panels, wiring, and removal of existing equipment, as herein specified.

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

E18.2 Scope of Work

E18.2.1 The Work under this Specification shall include but not be limited to:

(a) Suppling and installing a new pressure sensor inside the existing Baltimore Wastewater Pumping Station Wiring and program upgrading of the existing PLC panel;

(b) Decommissioning of existing north river bank force main leak monitoring system;

(c) Upgrade of existing south river bank force main leak monitoring system to include provision of new force main pressure sensor and new RTU panel; and

(d) Coordinating with City of Winnipeg's Water & Wastewater Department for new cell service tie-in of new RTU Panel to McPhillips Station SCADA system.

E18.3 Reference Standards, Specifications, and Drawings

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

(i) CAN/CSA C22.1 – Canadian Electrical Code, Part I: Safety Standard for Electrical Installations;

(ii) CAN/CSA C22.2 – Canadian Electrical Code, Part II: General Requirements; and

(iii) All local amendments to CAN/CSA C22.1 and C22.2.

(b) The latest version of the City of Winnipeg Standard Construction Specifications, Standards, and Bylaws

(i) City of Winnipeg Electrical Bylaws

(c) The following Specifications:

(i) E2 – Shop Drawings;

(ii) E16 – Force Main Across Bridge;

(iii) E17 – Force Main Connections and Related Works; and

(iv) E19 – Commissioning of Force Main.

E18.4 Submittals

E18.4.1 General

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

E18.4.2 Shop Drawings

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, all shop drawings, product data, and mill certificates for materials, components and systems.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, all wiring diagrams for the Work.

(c) The Contractor shall clearly identify specific products, component parts, and data applicable to the supply of materials. Inapplicable information shall not be included in the submission.

(d) The Contractor shall supplement product data with drawings to illustrate relations of component parts of systems.

E18.5 Materials

E18.5.1 General

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

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

(c) All materials shall conform to CAN/CSA.

E18.5.2 Low Voltage Wire and Cable (1000V and Below)

(a) Conductors: stranded Copper conductors, with minimum power conductor size: No. 12 AWG, minimum control conductor size: No. 14 AWG.

(b) Power conductors: size as indicated, with cross linked polyethylene (XLPE) insulation rated 1000 V – RW90 or RWU90, as indicated.

(c) Control conductors: XLPE insulation rated 600 V – RW90.

(d) Control panel wiring: copper with thermoplastic insulation type TEW rated at 600 V.

(e) Provide multi-conductor cables wrapped with interstitial fillers and an overall PVC (minus 40°C) flame retardant, low acid gas evolution jacket.

(f) Insulated ground conductors forming part of a multi-conductor cable assembly shall have green colour coding.

(g) Colour coding of insulated conductors shall be:

(i) 1-conductor cable-Black

(ii) 2-conductor cable-Black, White

(iii) 3-conductor cable-Red, Black, Blue

(iv) 4-conductor cable-Red, Black, Blue, White

(v) Multi-conductor cables-Number code

(vi) Intrinsically safe field wiring: Yellow

(h) Teck90 Cable Requirements:

(i) Conductors: Class B compressed stranded Copper conductors, size as indicated, with cross linked polyethylene (XLPE) insulation rated 1000V – RW90.

(ii) Inner jacket: Black PVC flame-retardant, moisture resistant

(iii) Armour: flexible interlocking aluminum armour.

(iv) Overall jacket: PVC flame-retardant, moisture and sunlight resistant, with fully printed label of cable description on jacket.

(v) Compliances: cable rated for wet and dry installation, and hazardous locations. Compliant with CSA C22.2 Nos. 131 and 174, including CSA FT1 and FT4.

(i) Armoured/Teck90 Cable connectors:

(i) Watertight connectors for non-hazardous areas.

(ii) Class 1, Zone 1, Group II B rated connectors c/w sealing compound for hazardous areas.

E18.5.3 Instrumentation/Signal Wiring

(a) Multi-conductor type with individually colour or number coding.

(b) Twisted pairs or triplets (triads) as required. Provide grouped cables with multiple pairs or triplets as required.

(c) Each pair or triplet to be wrapped in an aluminium / mylar shield with an overall bare stranded copper drain wire

(d) Ratings: 600VAC, insulated, 90°C.

(e) Minimum conductor size: #16AWG, stranded conductors, tinned-copper.

(f) Non-armour cable: overall aluminium sheath and an outer FR-PVC jacket.

(g) Armour cable (as indicated on drawings): overall interlocking aluminium flexible armour and an outer FR-PVC jacket.

(h) Multiple pairs/triplets to incorporate an overall aluminium/mylar shield with a copper drain wire.

(i) Armour cable connectors:

(i) Watertight connectors for non-hazardous areas.

(ii) Class 1, Zone 1, Group II B rated connectors c/w sealing compound for hazardous areas.

E18.5.4 Wiring Accessories

(a) Wire markers: computer printed, black letters on white background, self-laminating – vinyl markers, number of markers as required.

(b) Cable markers for cables or conductors greater than 13 mm diameter: strap-on type, rigid PVC, black letters on white background, with PVC covered aluminium straps.

(c) Terminal blocks: minimum 600 V rated, modular, sized to accommodate conductor size used.

(d) Where screw-type terminals are provided on equipment field wiring: terminate with pressure-type insulated copper fork tongue terminals.

(e) Splice connectors for wire sizes Nos. 12-10 AWG inclusive: compression spring type.

(f) Splice connectors for wire sizes No. 8 AWG and larger: split-bolt type, sized to suit number and size of conductors, c/w flame retardant foot-type insulator.

(g) Cable ties shall be nylon, one-piece, self-locking type.

(h) Connectors for Teck armoured cables installed in hazardous locations: design approved for the application.

(i) Connectors for Teck armoured cables installed in wet areas or outdoors: watertight design.

(j) Cable pulling lubricant: compatible with cable covering and will not cause damage and corrosion to conduits or ducts.

E18.5.5 Conduit

(a) Minimum conduit size: 21mm (3/4”).

(b) Rigid steel metal threaded conduit, hot dip galvanized inside and outside with a coated layer to inhibit rust. Complies with CAN/CSA C22.2 No. 45-M1981 (R2003).

(c) Epoxy coated conduit: with zinc coating and corrosion resistant epoxy finish inside and outside.

(d) Rigid PVC conduit, manufactured to schedule 40 wall thickness. Solvent weld compound for all PVC joints. Complies with CAN/CSA C22.2 No. 211.2-06.

(e) Flexible steel conduit and liquid tight flexible metal conduit, spirally wound interlocked aluminum armour construction with overall PVC jacket. Complies with CAN/CSA C22.2 No.56-04.

(f) Flexible conduit (coupling) for hazardous areas: suitable for Class 1, Zone 1, Group II B areas. Length to suit installation

(g) Electrical Metallic Tubing (EMT) conduit: size as indicated and complies with CSA C22.2 No.83-M1985 (R2003).

E18.5.6 Conduit Fastenings and Supports

(a) One-hole and two-hole hot dip galvanized steel straps.

(b) Hot dipped galvanized steel beam clamps.

(c) Hot dipped galvanized steel channel type supports, U-shape, size 41x41 mm, 2.5 mm thick.

(d) 6 mm diameter threaded galvanized steel rods to support suspended channels. Provide all necessary galvanized steel spring-loaded bolts, nuts, washers and lockwashers.

E18.5.7 Conduit Fittings

(a) Fittings: manufactured for use with conduit specified. Coating: same as conduit. Fittings to incorporate nylon insulated throat or bushing.

(b) Factory “ells” where 90° bends are required for 25 mm and larger conduits.

(c) Pressure type terminals for all rigid steel conduit grounding wire connections.

(d) Rigid steel conduit hub type connectors in wet or outdoor areas: nylon insulated with recessed neoprene ‘O’ ring.

(e) Liquid tight flexible conduit fittings to incorporate a threaded grounding core, nylon compression ring and gland. Insulated throat, male thread and locknut or bushing with an integral ‘O’ ring seal.

(f) Locknuts bonding type with sharp edges for digging into metal wall of enclosure.

(g) Thinwall (EMT) conduit fittings: die cast zinc, insulated compression type connectors (set screw type not acceptable).

E18.5.8 Expansion Fittings for Rigid Conduit

(a) Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

(b) Weatherproof expansion fittings for linear expansion at entry to panel.

E18.5.9 Conduit Fish Cord

(a) 6 mm stranded nylon cord, with tensile strength of 5 kN.

E18.6 Equipment

E18.6.1 General

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

E18.7 Construction Methods

E18.7.1 Codes and Standards

(a) Complete installation in accordance with the latest edition and all subsequent revisions of CAN/CSA C22.1, Manitoba addendums and revisions, and all City of Winnipeg Electrical Bylaws.

(b) Perform all work in accordance with drawings, specifications, applicable municipal and provincial regulations, and any pertinent inspection bulletins issued by the electrical inspection authority having jurisdiction over the installation. In no instance shall the standard established by the Drawings and Specifications be reduced.

(c) Provide a copy of all standards referred to in this Specification for use on site.

E18.7.2 Permits, Fees and Inspection

(a) Submit to Electrical Inspection Department and Supply Authority necessary number of Drawings and Specifications for examination and approval prior to commencement of the Work.

(b) Obtain site permits and pay associated fees.

(c) The Contractor shall provide Drawings and Specifications required by Electrical Inspection Department and Supply Authority at no cost.

(d) Notify Consultant of changes required by Electrical Inspection Department prior to making changes.

(e) Furnish Certificates of Acceptance from Electrical Inspection Department on completion of Work to Contract Administrator.

E18.7.3 Manufacturers and CSA Labels

(a) Manufacturer's nameplates and CSA labels are to be visible and legible after equipment is installed.

E18.7.4 Wiring Identification

(a) Provide permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and identification throughout system, i.e. panelboards, starters, terminal blocks, disconnect switches.

(b) Maintain identification system at all junction boxes, splitters, cabinets and outlet boxes.

(c) Use colour coded wires in communication cables, matched throughout system. All colour coding must adhere to the requirements of CAN/CSA C22.1.

E18.7.5 Touch-Up Painting

(a) Be responsible for field touch-up painting of all shop painted electrical equipment installed in this Contract.

(b) All surfaces to be painted shall be dry, clean, free from dust, dirt, grease, frost, rust, loose crystals or extraneous matter, tool and machine marks. Feather out edges of scratch marks to make patch inconspicuous.

(c) Apply one or more coats of paint until the damaged surface has been restored to original finish condition. Do not apply succeeding coats until preceding coat is dry and hard. Sand lightly between coats with No. 00 sandpaper.

(d) Be responsible for obtaining the necessary touch-up paint of the original type and quality from the equipment Manufacturer.

(e) Supervise priming and finish painting of all electrical equipment and material not shop painted.

E18.7.6 Wiring Installation

(a) Install all wire and cable according to the drawings, with a minimum power conductor size of No. 12 AWG and minimum control conductor size of No. 14 AWG.

(b) Pull cable into ducts and conduits in accordance with the cable Manufacturer's recommendations, using patented cable grips suitable for the type of cable or using pulling eyes to be installed directly onto the cable conductors.

(c) Limit pulling tensions to those recommended by the manufacturer to avoid overstressing cable.

(d) Utilize adequate lubricant when pulling cables through ducts and conduits to minimize wear on cable jackets.

(e) Install all through wiring in junction and pull boxes having no connection within the box with a minimum of 150 mm of slack left inside the box.

(f) Install instrument and thermocouple extension wiring separate from power and control wiring.

(g) Make connections to equipment “pig-tails” with mechanical, insulated, screw-on connectors for wire sizes Nos. 12-10 AWG. For wire sizes No. 8 AWG and larger utilize split-bolt connectors, taped with three layers minimum of insulating tape.

(h) No splices shall be permitted in cable or wiring runs, and shall only be permitted in junction boxes.

(i) Unless otherwise specified, make all wiring tapes, splices and terminations with identified compression screw type terminal blocks, securely fastened to avoid loosening under vibration or normal strain. Make connections for interior and exterior lighting circuits and 120 V, 15 amp convenience receptacle circuits using screw-on or split-bolt connectors and insulating tape.

(j) Identify each conductor by plastic slip-on markers at each termination indicating the circuit designation or wire number.

(k) Identify each cable by attaching a suitable marker, stamped or indelibly marked with the cable number, at each end of the cable and in all intermediate manholes, junction boxes and pull boxes.

E18.7.7 Grounding and Bonding of Conductors

(a) Conductors shall be concentric stranded, soft drawn copper. Insulated conductors, where required by Inspection Authorities or specified, shall be type TW, 600-volt rating, green colour, and shall meet the same flame-spread requirements of all wiring in the area and conditions where they are installed.

(b) Conductors shall be sized at least per the requirements of the latest version of the Canadian Electrical Code and of the local Authority, or as indicated, whichever is the greater size.

(c) Where direct buried bare ground conductor comes into contact with corrosive material, the conductor shall be tinned.

E18.7.8 Direct Buried Cables in Trenches

(a) Trenching shall be approximately 1000mm in depth, width to suit proper installation.

(b) Backfill for trenches for all direct buried cables, ducts, conduits, etc., shall consist of fine sand (minimum 100 mm below and above cables, etc.) and firmly compacted. Backfill finishing material shall be as indicated in Division 03.

(c) All direct buried cables, ducts, etc., crossing over each other or over/under other types of underground service shall be encased in wood planks treated with pentachlorophenol.

(d) Frozen earth, large lumps or boulders shall not be used for backfill material.

(e) Provide treated wood planks meeting approved wood treatment materials over all buried cables, etc., under existing or future roads and sidewalks.

(f) Provide sleeves under all parking, concrete and traffic areas for cables.

(g) Where cables enter building provide a vertical 100 X 250 mm white sign with black wording ELECTRICAL CABLES securely fastened to the building wall approximately 300 mm above finished grade.

E18.7.9 Direct Buried Cable Installation and Protection

(a) Provide identification tape labelled as indicated showing location of direct buried cables.

(b) After specified sand bed is in place, lay cables in trench, maintaining a 75 mm minimum clearance from each side of trench to nearest cable. Do not pull cable into trench.

(c) Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining mir1Imum cable separation and bending radius requirements.

(d) Underground cable splices not acceptable.

(e) Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

(f) Maintain 75 mm minimum separation between cables of different circuits. Maintain 300 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables. Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables with fire alarm and control cables in upper position. Install treated planks on lower cables 0.6 m in each direction at crossings.

(g) After sand protective, cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

E18.7.10 Instrumentation Devices

(a) General

(i) Submit shop drawings in accordance with E18.4, “Submittals”.

(ii) Provide each instrument with mechanisms that are corrosion resistant.

(iii) Provide each instrument with mechanisms enclosed in a dustproof and a moisture proof case.

(iv) Provide all indicator and gauge dials finished in permanent white with black graduations and figures.

(v) Potentiometric signals shall have a "live" zero or positive minimum value in the signal range.

(vi) Each component shall be carefully selected and designed for a long lifetime with ample margin to withstand transient and other surge voltages, which may occur in the circuits from any source in the power supply.

(vii) Each component and composite instrument shall be suitable for the location and installation position at the attitude designated on the drawings, e.g., horizontal, vertical or sloped position.

(viii) The Contractor shall provide all power supplies. Instruments shall be powered from the same control panel to which the measured signal is being transmitted, unless specifically noted otherwise. The power source to each instrument shall be individually fused, fuse size based on instrument power requirements.

(ix) Integrating counters and elapsed time meters shall show the total quantity that has passed through the meter and shall not require the use of a multiplier other than cipher additions. The integrators shall have at least seven figures.

(x) All control panel mounted instruments shall be suitable for flush mounting and shall be furnished with bezel.

(xi) For factory calibrated instruments, the factory calibration sheets shall be submitted in the force main operations and maintenance manual specified in E20.4.1, “Force Main Operations and Maintenance Manual”.

(xii) For field calibrated instruments, the field calibration sheets shall be submitted in the force main operations and maintenance manual specified in E20.4.1, “Force Main Operations and Maintenance Manual”.

(xiii) All instruments to be installed per Manufacturer's recommended installation guidelines.

(xiv) Provide instrument tag fastened to each instrument to match instrument list. Instrument tag to be stainless steel or powder coated aluminum.

E18.7.11 Instruments Installation

(a) Mounting" shall mean the positioning and fastening with proper brackets in the position required.

(b) All equipment shall be mounted in accordance with Manufacturer's recommendations.

(c) Locations of all field instruments are subject to modification by the Contract Administrator, who reserves the right to move any item up to three (3) meters from the position shown, without change to the contract price, provided notice is given before the related work has commenced.

(d) Exact locations of all field instruments shall be site determined by the Contractor to the satisfaction of the Contract Administrator, to ensure proper operation of the device.

(e) Employ any and all means of trade, skill, and workmanship to install all field instruments to the satisfaction of the Contract Administrator.

E18.7.12 Pressure Sensors/Transmitters

(a) Flange mounted continuous pressure monitoring device to provide signal proportional to force main system water pressure.

(b) Instrument identification:

(i) Baltimore Wastewater Pumping Station Force Main Pressure

(ii) South River Bank Side Force Main Pressure:

(c) Power supply: 24 VDC.

(d) Output: 4-20mA DC.

(e) Range: 1200 to +100 mbar.

(f) CAN/CSA approved.

(g) Acceptable manufacturer/model shall be Rosemount 2051 Series or equal, as approved by the Contract Administrator in accordance with B7, “Substitutes”.

E18.7.13 South Side Force Main RTU Panel

(a) Provide all labour and material required to disconnect and remove existing south side Forcemain Leak Monitor Remote Panel to be replaced with new south side Forcemain RTU Panel as indicated on the drawings and as specified herein:

(i) Outdoor, post-mounted cabinet c/w the following:

- EEMAC 4 rated enclosure;
- 12 gauge
- Hinged lockable single door.
- Electric heating and insulation rated for -40$^{o}$C ambient.
- All front panel mounted devices to be EEMAC 4 rated.
- Panel finish: exterior - ASA 61 light grey enamel, interior - White epoxy paint.

(b) Terminal strips (identified) for all wiring.

(c) Lamacoid identification nameplates on all components.

(d) Square “D” SDSA 1175 lightning arrestor.

(e) Circuit breakers, 120 VAC, number and rating to suit

(f) Control relays, type and number to suit

(g) 200W electric panel heater c/w thermostat control.

(h) 125VAC, 15A duplex convenience receptacle

(i) 120VAC:24 VDC power supply, rated 3A.

(j) TVSS surge protector, 120 VAC, sized to suit

(k) Rosemount ROC 809 Flow Computer

(l) Rosemount No.8712DR remote magmeter transmitter

(m) Bluetree wireless data cellular modem

(n) Cat 6 Ethernet cable

(i) Acceptable panel manufacturer shall be Manco Controls, Indus Automation.

E18.8 Quality Control

E18.8.1 Inspection

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

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

E18.8.2 Access

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

E18.8.3 Materials

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

E18.8.4 Testing of Direct Buried Cable

(a) Provisions:

(i) Perform tests using qualified personnel. Provide necessary instruments and equipment.

(ii) Check phase rotation and identify each phase conductor of each feeder.

(iii) Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

(b) Pre-Acceptance Tests

(i) After installing cable but before terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

(ii) Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

(c) Provide the Contract Administrator with a list of test results showing location at which each test was made, circuit tested and result of each test.

(d) Remove and replace entire length of cable if cable fails to meet any of test criteria.

(e) The Contractor is responsible for making all necessary repairs to installation resulting from improper backfilling, compaction, etc.

E18.9 Measurement and Payment

E18.9.1 Electrical and Controls

(a) The supply and installation of electrical items and their appurtenances for electrical and controls shall not be measured. This electrical Work shall be paid for at the Contract Lump Sum Price for, “Supply and Install Electrical and Controls”, performed

in accordance with this Specification and accepted by the Contract Administrator, which shall be paid in full for supplying all materials performing all operations herein described and all other items incidental to the Work.

## E19. COMMISSIONING OF FORCE MAIN

E19.1 Description

(a) This Specification shall cover all operations relating to the commissioning of the Baltimore force main system crossing the St. Vital Bridge, as herein specified.

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

E19.2 Scope of Work

E19.2.1 The Work under this Specification shall include but not be limited to:

(a) Developing a force main shut down and commissioning plan in coordination with the City and the Contract Administrator;

(b) Meeting(s) with the City and Contract Administrator to discuss shut down and commissioning requirements;

(c) Completion of installation of the aerial force main and buried connections, except for final closure connection;

(d) Verification of valve open-close operations by City personnel;

(e) Flushing and Hydrostatic leakage testing of the force main, in accordance with E16, “Force Main Across Bridge” and E17, “Force Main Connections and Related Works”;

(f) Completion of installation of the instrumentation and controls in accordance with E18, “Electrical and Controls”;

(g) Putting the new force main into service; and

(h) Preparation of Commissioning Documentation.

E19.3 Submittals

E19.3.1 Shut Down and Commissioning Plan

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule for the shutdown and commissioning of the force main system.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the commencement of any scheduled Work on the Site, a shutdown and commissioning plan. The Contractor shall meet with the City and the Contract Administrator to discuss specific coordination and shutdown and commissioning requirements and shall develop this plan in consultation with the above noted parties. The plan will include the full scope of work, summarizing responsibilities of the Contractor, the City, and the Contract Administrator. The plan will also include a detailed sequence of operations.

E19.4 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 2125 – Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water systems; and

(ii) CW 2145 – Sewer and Manhole Inspection.

(b) The following Specifications

(i) D34 – Environmental Protection Program;
(ii) E2 – Shop Drawings;
(iii) E12 – Removal of Existing Aerial Supported Force Main Pipe;
(iv) E16 – Force Main Across Bridge;
(v) E17 – Force Main Connections and Related Works;
(vi) E18 – Electrical and Controls; and
(vii) E20 – Force Main Operations and Maintenance Manual.

E19.5 Materials

E19.5.1 General

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

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

E19.6 Equipment

E19.6.1 General

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

E19.7 Construction Methods

E19.7.1 Force Main Commissioning

(a) Install the new force main pipe while maintaining uninterrupted service of the temporary bypass system.

(b) Develop approved shutdown and commissioning plan in coordination with the City and the Contract Administrator to commission the new force main pipe without interrupting service. The Contractor shall meet with the City and the Contract Administrator to discuss shutdown and commissioning requirements.

(c) Commissioning of the force main shall take place overnight to minimize service disruption and to complete switchover when Baltimore Pump Station nighttime pump cycle periods have increased. The switchover shall be completed between midnight and 5:00 a.m.

(d) Complete installation of all aerial force main pipe components;

(e) Complete installation of all necessary electrical and controls.

(f) Shut down the temporary bypass valves.

(g) Brace shut the flap gate in the Baltimore Pump Station.

(h) Complete connection and tie-in to existing force main.

(i) Open force main valves.

(j) Perform testing of the system.

(k) Commissioning operations will likely take place in fall months, and will be weather dependent. Commissioning operations shall not take place when temperatures fall below $0^0$C.

(l) Instrument Manufacturer's qualified service representative shall be on site as required or as otherwise specified, whatever is more stringent, to perform instrument calibration, testing and commissioning and to instruct City's representative in all aspects of instrument operation and maintenance.

(m) The Contractor shall provide a minimum of one week notice of the proposed shutdown and commissioning date and be prepared to make adjustments to this date should weather conditions be unfavourable.

(n) The Contract Administrator and the City will be in attendance during the shutdown and commissioning period.

E19.7.2 Instrumentation & Controls Start-Up & Commissioning

(a) The Instrument Manufacturer's qualified service representative shall be on site as required or as otherwise specified, whatever is more stringent, to perform instrument calibration, testing and commissioning and to instruct City's representative in all aspects of instrument operation and maintenance.

(b) Upon completion of the installation, the Contractor shall be responsible for testing to determine correct system operation and sequences as intended in the Contract Documents. Process Instruments such as flow, level, pressure transmitters, etc., shall be checked for operation prior to process start-up, by manipulating operating controls like set points, auto-manual selectors, etc. Status and alarm contacts to be checked by manipulation or jumpering at the sensing element.

(c) Check sheets for all instrumentation and PLC I/O to be filled out during the commissioning process and submitted to the Contract Administrator. Completed instrumentation check sheets, signed and dated, to be included in the Operations & Maintenance manual identified in E20, “Force Main Operations and Maintenance Manual”.

(d) Results of tests are to be logged by the Contractor and submitted to the Contract Administrator. Any apparent defects shall be reported and corrected.

(e) When preliminary checks have been completed and process equipment is operating or ready to operate, individual systems shall be calibrated in accordance with the latest ISA recommendation.

E19.8 Quality Control

E19.8.1 Inspection

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

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

E19.8.2 Access

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

E19.8.3 Testing

(a) Instrument Manufacturer's qualified service representative shall be on site as required or as otherwise specified, whatever is more stringent, to perform instrument calibration, testing and commissioning and to instruct the Contract Administrator in all aspects of instrument operation and maintenance.

(b) Thoroughly test all control equipment, components, and systems for proper operation and report in writing to the satisfaction of the Contract Administrator.

(c) Tests shall include:

(i) Complete operational test including interlocks, functions, features, options, etc., for all instrumentation, PLC, and computer system control operations;

(ii) Operation of alarm initiating devices; and

(iii) Calibration of all instruments.

(d) Provide loop check sheet for each I/O point to be submitted to the Contract Administrator prior to start-up and commissioning.

(e) Supply all necessary test equipment and personnel to completely test the entire instrumentation and process control system.

(f) The Contractor shall provide written confirmation of the satisfactory completion of the testing of all the system and equipment specified herein prior to scheduling of final start-up and commissioning.

E19.9 Measurement and Payment

E19.9.1 Force Main Commissioning

E19.10 Force main commissioning shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Commission Force Main", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

## E20. FORCE MAIN OPERATIONS AND MAINTENANCE MANUAL

E20.1 Description

(a) This Specification shall cover all operations for the development of a force main operations manual.

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

E20.2 Scope of Work

E20.2.1 The Work under this Specification shall include but not be limited to:

(a) Preparing an Operation and Maintenance Manual; and

(b) Coordinating with the City and Contract Administrator for inclusion of all required elements in the manual.

E20.3 Reference Standards, Specifications, and Drawings

(a) The following Specifications

(i) E2 – Shop Drawings;

(ii) E16 – Force Main Across Bridge;

(iii) E17 – Force Main Connections and Related Works;

(iv) E18 – Electrical and Controls; and

(v) E19 – Commissioning of Force Main.

E20.4 Submittals

E20.4.1 Force Main Operations and Maintenance Manual

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least twenty (20) Business Days prior to commissioning of the force main system, a complete Operations and Maintenance manual. Submission of individual data will not be accepted, unless directed by the Contract Administrator.

E20.5 Materials

E20.5.1 General

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

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

E20.6 Equipment

E20.6.1 General

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

(b) Development of and submission of the force main operations and maintenance manual shall take place in advance of commissioning operations. Refer to E19, “Commissioning of Force Main”.

E20.7 Construction Methods

E20.7.1 Force Main Operations and Maintenance Manual

(a) Organize product, operating and maintenance data in the form of an instructional manual.

(b) Provide table of contents indicating title of project; date of submission; name, address and telephone number of Contractor; schedule of products indexed to content of volume.

(c) Provide tabbed fly leaf for each separate product, with typed description of product.

(d) For each product list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

(e) For product data, mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

(f) Provide drawings to supplement product data to illustrate relations of component parts of systems.

(g) Operating data shall include the following for each system: description of system and component parts; start-up, break-in and routine normal operating instructions and sequences; normal operating characteristics and limiting conditions; regulation, control, stopping, shut-down and emergency instructions; summer, winter and any special operating instructions.

(h) Maintenance data shall include the following for each component and system: servicing, maintenance and trouble-shooting instructions; disassembly, repair and reassembly instructions; parts list, illustrations, assembly drawings and diagrams required for maintenance; schedules of tasks, frequency, tools required and task time; list of spare parts, current prices and recommended quantities to be maintained in storage.

(i) Specific electrical items identified for the operations and maintenance manual are identified in E18.7.10, “Instrumentation Devices”.

(j) Include copies of all test reports.

(k) Submit a draft Operation and Maintenance Manual in accordance with E20.4.1, “Force Main Operation and Maintenance Manual”. The final manual shall be approved by the Contract Administrator prior to final inspection.

E20.8 Quality Control

E20.8.1 Inspection

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

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

E20.8.2 Access

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

E20.9 Measurement and Payment

E20.10 Force Main Operations and Maintenance Manual

(a) The creation of a force main operations and maintenance manual shall not be measured and shall be considered incidental to the Work and no separate measurement or payment shall be made.

## E21. DECOMMISSIONING AND REMOVAL OF TEMPORARY BYPASS FORCE MAIN

E21.1 Description

(a) This Specification shall cover all operations for the decommissioning, removal, and salvaging of the temporary bypass force main, as herein specified.

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

E21.2 Scope of Work

E21.2.1 The Work under this Specification shall include but not be limited to:

(a) Flushing and disinfecting the temporary bypass force main;

(b) Removing, cleaning, and inventorying salvageable components;

(c) Coiling of heating piping, for collection by others;

(d) Delivering and offloading salvageable components to the City's yard;

(e) Removing bypass concrete pads;

(f) Removing bypass Hydro service; and

(g) Restoring and cleaning all existing facilities.

E21.3 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 2125 – Flushing, Hydrostatic Leakage Testing and Disinfection of Watermains and Water Services;

(b) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E2 – Shop Drawings;

(iii) E16 – Force Main Across Bridge;

(iv) E17 – Force Main Connections and Related Works;

(v) E18 – Electrical and Controls; and

(vi) E19 – Commissioning of Force Main.

E21.4 Submittals

E21.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule for the shutdown and commissioning of the force main system.

E21.4.2 Temporary Bypass Salvage Inventory

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the planned delivery of salvage materials, a detailed inventory list of all salvageable materials. This list will be provided to the City upon delivery of salvageable materials.

E21.5 Materials

E21.5.1 General

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

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

E21.6 Equipment

E21.6.1 General

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

E21.7 Construction Methods

E21.7.1 Salvageable Materials

(a) The following is a list of salvageable materials to be returned by the Contractor:
  (i) Aluminum piping (40’ segments);
  (ii) Chain link fencing;
  (iii) Insulated tarps.

(b) The following is a list of salvageable materials that will be removed by others:
  (i) Heater, heating coils, and support boilers; and
  (ii) Electrical service.

E21.7.2 Remove and Return Temporary Bypass Force Main

(a) Flush and disinfect existing bypass pipes prior to removal in accordance with CW 2125. Disinfect with 5 mg/l chlorine solution, directing all wastewater into a wastewater sewer.

(b) Remove temporary bypass components and carefully disassemble components so as not to damage.

(c) The Contractor shall salvage, clean, and suitably prepare barrier rails for the City’s reuse.

(d) Carefully prepare and group elements together and palettize for salvage. Prepare an inventory list of materials to be salvaged.

(e) Notify Contract Administrator for inspection and assessment of salvageable materials.

(f) Upon confirmation of salvageable materials, the Contractor shall submit a detailed inventory of the materials that will be transported to the City's yard. No materials shall be transported until the Contract Administrator has reviewed the list and authorized transportation of materials.

(g) The Contractor shall provide the City with 1 (one) week's advance notice of their planned delivery date of salvageable materials.

(h) All salvageable materials and other suitable components shall be transported by the Contractor to the City's Wye yard at Dawson Rd N at Van Bellegham Ave (entrance off Dawson Rd N).

(i) The Contractor shall unload and stockpile materials as directed by City staff.

(j) The Contractor shall provide the City with a detailed inventory list of all salvageable materials.

(k) The Contractor shall be responsible for the careful handling, safe storage and transportation of all salvageable components and for replacement of any damaged or missing pieces.

E21.7.3 Remove Existing Concrete Pad

(a) Remove existing concrete pad adjacent to Churchill Drive as shown on the Drawings.

(b) Remove existing concrete pad adjacent to Kingston Row as shown on the Drawings.

E21.7.4 Remove Temporary Hydro Service

(a) Remove temporary Hydro service for temporary bypass.

E21.8 Quality Control

E21.8.1 Inspection

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

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

E21.9 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.

E21.10 Measurement and Payment

E21.10.1 Force Main Decommissioning

(a) Force main commissioning shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Decommission Force Main", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

## E22. FORCE MAIN ENCLOSURE

E22.1 Description

(a) This Specification shall cover all operations related to the supply and installation of two corrugated steel force main enclosures, as herein specified.

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

E22.2 Scope of Work

E22.2.1 The Work under this Specification shall include but not be limited to:

(a) Supplying and installing a force main enclosure around the force main tie-ins at Piers 2 and 7;

(b) Providing any necessary foundation support; and

(c) Providing entry access into the enclosure.

E22.3 Reference Standards, Specifications, and Drawings

(a) The following Specifications

(i) D34 – Environmental Protection Program;

(ii) E16 – Force Main Across Bridge;

(iii) E17 – Force Main Connections and Related Works; and

(iv) E19 – Commissioning of Force Main.

E22.4 Submittals

E22.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule for the shutdown and commissioning of the force main system.

E22.4.2 Shop Drawings

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, all shop drawings, proposed product data, and mill certificates for all materials.

E22.5 Materials

E22.5.1 General

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

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

E22.5.2 Force Main Enclosure

(a) The force main enclosures shall be a frameless steel modular enclosure, fabricated of corrugated steel panels. Panels shall be hot dip galvanized and contain a protective coating.

(b) Panels shall be 0.114 mm thick.

(c) A lockable steel man door shall be supplied as part of the enclosure to provide access to the force main.

(d) Connection details shall be compatible with the frameless steel modular enclosure.

(e) Alternates for the frameless steel modular enclosure may be presented in accordance with B7, “Substitutes”.

E22.5.3 Force Main Enclosure Strip Footing

(a) The force main enclosures shall be supported on a concrete strip footing in accordance with the requirements of CW 3130.

(b) The strip footing shall be 300mm wide.

(c) The strip footing may have a flat surface.

E22.5.4 Gravel Fill For Interior of Enclosure

(a) Gravel fill shall be 20 mm down material.

E22.6 Equipment

E22.6.1 General

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

E22.7 Construction Methods

E22.7.1 Force Main Enclosure

(a) The enclosure shall be installed after completion of the commissioning of the force main.

(b) The enclosure will be fabricated of corrugated steel material.

(c) The enclosure shall encompass an area of 2.5 m x 2.5 m.

(d) The enclosure will surround the force main pipes at Piers 2 and 7 and will be equipped with a man door for access. The enclosure shall be located a minimum of 1m from each side and in front of the force main pipe to accommodate full access and inspection.

(e) The enclosure shall have a height of 2.438 m high.

(f) The enclosure will be elevated a minimum 150mm from the ground.

(g) The enclosure will either be supported on an independent concrete strip footing.

(h) The enclosure will be modified to meet and be flush to the concrete pier face.

(i) The enclosure shall be supported and connected to34567890- a three-sided concrete strip footing.

(j) Place 100mm thick gravel fill within the interior of the enclosure.

E22.8 Quality Control

E22.8.1 Inspection

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

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

E22.8.2 Access

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

E22.9 Measurement and Payment

E22.9.1 Force Main Enclosure

(a) The force main enclosure shall not be measured. This item of work shall be handled as a Change in Work item, in accordance with the requirements of C7. Payment for this item of Work will be allocated from the Cash Allowance.

## E23. SITE RESTORATION

E23.1 Description

(a) This Specification shall cover all operations related to site restoration, as herein specified.

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

E23.2 Scope of Work

E23.2.1 The Work under this Specification shall include but not be limited to:

(a) Restoring the existing gravel Active Transportation pathway beneath the bridge adjacent to Churchill Drive;

(b) Restoring the granular material on the north and south riverbanks beneath the bridge;

(c) Seeding and sodding operations; and

(d) Completing general site cleanup and restoration.

E23.3 Reference Standards, Specifications, and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 1130 – Site Requirements;
(ii) CW 3110 – Sub-Grade, Sub-Base and Base Course Construction;
(iii) CW 3130 – Supply and Installation of Geotextile Fabrics;
(iv) CW 3150 – Gravel Surfacing;
(v) CW 3510 – Sodding;
(vi) CW 3520 – Seeding; and
(vii) CW 3540 – Topsoil and Finish Grading for Establishment of Turf Areas;

(b) The following Specifications

(i) D34 – Environmental Protection Program;
(ii) E19 – Commissioning of Force Main; and
(iii) E21 – Decommissioning and Removal of Temporary Bypass Force Main.

E23.4 Materials

E23.4.1 General

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

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

E23.4.2 Granular Fill Materials

(a) Granular fill materials shall be 20mm down limestone.

E23.4.3 Grass Seed

(a) Grass seed shall be a boulevard mix.

E23.5 Equipment

E23.5.1 General

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

E23.6 Construction Methods

E23.6.1 General

(a) Further to Clause 3.3 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.

E23.6.2 Restore Active Transportation Pathway

(a) Restore existing gravel Active Transportation pathway beneath the bridge adjacent to Churchill Drive, at the locations shown on the Drawings.

(b) Install geotextile fabric in accordance with CW 3130.

(c) Resurface pathway in accordance with CW 3110 and CW 3150.

E23.6.3 Restore Granular Material Beneath Bridge

(a) Grade and restore the granular surface on the north riverbank beneath the bridge adjacent to Churchill Drive, at the location shown on the Drawings.

(b) Grade and restore the granular surface on the south riverbank beneath the bridge adjacent to Kingston Row, at the location shown on the Drawings.

(c) Granular surfacing shall take place in accordance with CW 3110 and CW 3150.

E23.6.4 Revegetate Disturbed Areas

(a) Disturbed areas shall be revegetated in the locations shown on the Drawings.

(b) Topsoil operations shall be completed in accordance with CW 3540.

(c) Sodding operations shall be completed in accordance with CW 3510.

(d) Seeding operations shall be completed in accordance with CW 3520.

E23.7 Quality Control

E23.7.1 Inspection

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

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

E23.7.2 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.

E23.8 Measurement and Payment

E23.8.1 Site Restoration

(a) Site restoration shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Site Restoration", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

## E24. OFFICE FACILITIES

E24.1 Description

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

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

E24.2 Reference Standards, Specifications, and Drawings

(a) The following Specifications

(i) E3 – Mobilization and Demobilization.

E24.3 Materials

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

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

E24.4 Equipment

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

E24.5 Construction Methods

E24.5.1 Site Office Facilities

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

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

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

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

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

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

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

(vii) Two separate land lines for a fax machine and a computer modem shall also be supplied and serviced by the Contractor;

(viii) One refrigerator, approximately 5 $ft^3$ and one mid-size microwave shall be supplied by the Contractor;

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

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

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

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

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

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

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

E24.6 Measurement and Payment

E24.6.1 Site Office Facilities

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