THE CITY OF WINNIPEG

TENDER

TENDER NO. 347-2020

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, July 8, 2020.

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 Bidder may view the Site without making an appointment.

B4. ENQUIRIES

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

B4.2 If the Bidder finds errors, discrepancies or omissions in the 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 D4.

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

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

B8.4 The Bid shall be submitted electronically through MERX at www.merx.com.

B8.4.1 Bids will **only** be accepted electronically through MERX.

B8.5 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 D27. Any such costs shall be determined in accordance with D27.

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) Insituform Technologies Ltd. – Review of constructability.

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 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); and

(d) upon request of the Contract Administrator, provide the Security Clearances in accordance with PART F - Security Clearance.

B13.4 Further to B13.3(a) upon request the Bidder and/or any proposed Subcontractor completing CIPP lining shall demonstrate the following specific qualifications in accordance with B13.8:

(a) Three (3) examples of successful 600 mm or greater diameter, NSF-61, pressure CIPP installations with operating pressures equal to or greater than 415 kPa (60 psi) in the past 5 years.

(b) Three (3) examples of successful CIPP installations within inverted siphons within the last 5 years.

(c) 3000 m of NSF-61, CIPP pressure lining completed with operating pressures equal to or greater than 415 kPa (60 psi) within the last 5 years.

B13.5 Further to B13.3(a) upon request the Bidder shall demonstrate the following specific qualifications for key project personnel (proposed project manager and site foreman) in accordance with B13.8:

(a) Three (3) example of successful NSF 61, pressure CIPP installations with operating pressures equal to or greater than 415 kPa (60 psi) in the past 5 years.

(b) Three (3) examples of successful CIPP installations within inverted siphons.

B13.6 The Bidder shall submit, within five (5) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the following for the CIPP lining systems proposed for use on this project:

(a) Provide the following for each system proposed (indicate where each system is to be used):

(i) Resin and tube manufacturer(s)

(ii) Proposed design material properties

(iii) Historical testing results for the proposed lining system, including ASTM D638, D790, D2290 and D2990 test results. Include field testing results (ASTM D638, D790, and D2290) from a minimum of one (1) previous project installed by the Bidder or Subcontractor completing the lining work.

(b) For each proposed CIPP lining system demonstrate the following:

(i) A minimum of three (3) successful projects or 1500 m of CIPP installations within the last 5 years by the Contractor or Subcontractor completing the lining work with the proposed lining system.

B13.7 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/.

B13.8 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 and key project personnel. The Bidder shall utilize Form L: Contractor Experience or provide similar project sheets containing all information identified in Form L: Contractor Experience. Experience provided for key project personnel must be accompanied by a project specific submission for each referenced project, complete with all identified reference contact information.

B13.9 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(b).

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 Further to B18.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B18.4.2 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 D27 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. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of rehabilitation of the Kildonan-Redwood Feeder Main river crossing by CIPP.

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

(a) Site access;

(b) Disassembly of existing chambers and feeder main piping to facilitate the work;

(c) Pipeline cleaning, preparation, and inspection;

(d) Rehabilitation the pipeline using CIPP;

(e) Reassembly of existing chambers and feeder main piping;

(f) Miscellaneous piping and chamber restoration works; and

(g) Site restoration.

D3. DEFINITIONS

D3.1 When used in this Tender:

(a) "**ACI**" means American Concrete Institute;

(b) "**ASTM**" means American Society for Testing and Materials;

(c) "**AWWA**" means American Water Works Association;

(d) "**AWWA Class III**" means a rehabilitation product meeting the structural requirements defined in the AWWA Committee Report - Structural Classifications of Pressure Pipe Linings (2019) for a Class III liner;

(e) "**CIPP**" means cured-in-place pipe;

(f) "**CSA**" means Canadian Standards Association;

(g) "**FRP**" means Fibre Reinforced Polymer;

(h) "**Host Pipe**" means the existing sewer or water main intended for rehabilitation through the installation and curing of a CIPP liner;

(i) "**ISO**" means International Organization for Standardization;

(j) "**NSF**" means NSF International;

(k) "**PCCP**" means Prestressed Concrete Cylinder Pipe;

D4. CONTRACT ADMINISTRATOR

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

Nathan Kehler
Municipal Engineer

Telephone No. 204-928-7436
Email Address nathan.kehler@aecom.com

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

D5. CONTRACTOR'S SUPERVISOR

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

D6. NOTICES

D6.1 Except as provided for in 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.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D4.

D6.3 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

D7. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

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

D9. SAFE WORK PLAN

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

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

D9.3 Notwithstanding B13.7 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D10. INSURANCE

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

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

(b) if applicable, 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) The Contractor shall provide and maintain CPL insurance in the amount of at least one million dollars ($1,000,000) per occurrence and one million dollars ($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 costs;

(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.

(d) CPL insurance is to remain in place during the performance of the Work and during the warranty period.

D10.2 Deductibles shall be borne by the Contractor.

D10.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, as applicable.

D10.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11. CONTRACT SECURITY

D11.1 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.

D11.2 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.

D11.3 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 D11.1(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.

D12. SUBCONTRACTOR LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D13. EQUIPMENT LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents if applicable.

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

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

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

(a) Mobilization(s) to site;

(b) Chamber and piping disassembly;

(c) Water main cleaning and prep work;

(d) installation of CIPP liners;

(e) chamber and piping reassembly;

(f) leakage testing;

(g) pipeline disinfection;

(h) restoration; and

(i) planned breaks in the performed work pursuant to D17.7.

D14.4 The Contractor shall provide an updated detailed work schedule at least once per month or within two (2) Business Days of a request by the Contract Administrator.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 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.

D15.2 The Contractor shall not commence any Work on the Site until:

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

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

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

(iii) the Safe Work Plan specified in D9;

(iv) evidence of the insurance specified in D10;

(v) the contract security specified in D11;

(vi) the Subcontractor list specified in D12;

(vii) the equipment list specified in D13; and

(viii) the detailed work schedule specified in D14.

(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.

D15.3 The City intends to award this Contract by August 21, 2020.

D15.3.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. SCHEDULE RESTRICTIONS

D16.1 Feeder Main Shutdowns

D16.1.1 Feeder main shutdowns will be scheduled based on a number of factors including routine maintenance and repair work, water demand, weather and other factors. The City shall endeavour to make the specified time periods available to the Contractor to schedule his Work requiring isolation and draining of various feeder mains, without limiting the City's control over the operation of the regional water system to complete other work, maintain adequate system service and maintain the integrity of the infrastructure. The City shall reserve the right to cancel and/or delay these schedule dates at any time, due to any circumstances that could adversely affect water supply system operation, including but not limited to high water demand, abnormal weather, failures of related water system components and/or security concerns.

D16.1.2 The Contractor shall provide notice to the Contract Administrator in writing, a minimum of ten (10) Business Days prior to requiring the shutdown. The City will endeavour to schedule the shutdown as requested, pursuant to D16.1.1.

D16.1.3 Feeder main shutdowns and disassembly of feeder main components will not be permitted until all required submissions and protocols have been reviewed and accepted by the Contract Administrator and City. The Contractor should allow for a ten (10) Business Day review period by the City once accepted by the Contract Administrator.

D16.1.4 The Kildonan-Redwood Feeder Main shall be handed over to the City ready for return to service within forty-two (42) Calendar Days of disassembly upon commencement of the Work.

D17. WORKING DAYS

D17.1 Further to C1.1(tt), the Contract Administrator's determination of whether or not atmospheric and Site conditions are such that a Working Day is deemed to have elapsed may be based at

one time on one type of work while at another time a Working Day may be based on another type of work. When more than one type of major work is involved, the quantity of equipment that must be able to work in order to meet the requirements of a Working Day may vary considerably from that specified in the General Conditions.

D17.2 In the event that incidental work is behind schedule which, in the opinion of the Contract Administrator, should have been or could have been carried out by the Contractor in conjunction with or immediately following work of a major type, the City hereby reserves the right to charge Working Days on the incidental work until such time as it is up to schedule.

D17.3 When the major type of work involves restoration of the site to the condition it was prior to rainfall, Working Days shall not be charged.

D17.4 The Contract Administrator will furnish the Contractor with a daily record for each major type of work showing various information concerning the equipment, the time it worked, could have worked and Working Days charged. This report is to be signed each day by an authorized representative of the Contractor.

D17.5 Notwithstanding C1.1(tt) if the Contractor chooses to work on a Saturday, Sunday, or statutory or civic holiday and is able to complete at least seven (7) hours of work during the period between 7:00 a.m. Winnipeg time or the time the Contractor's operations normally commence, whichever is earlier, and 7:00 p.m. Winnipeg time the day shall be considered a Working Day.

D17.6 Working Days shall be incurred by the Contractor for every Working Day as defined herein. Working days shall be incurred starting on the date the Contractor commences work on site, or the date of commencement identified on the Contractors submitted schedule (D14), whichever occurs first.

D17.7 Planned Breaks in Construction

(a) The Contractor will be permitted planned suspensions of on-site construction to facilitate crew breaks and seasonal weather breaks where contract work is not completed. Working Days will not be incurred during these periods.

(b) All planned breaks in on-site construction activity must be clearly identified in the Contractors detailed construction schedule (D14) and notice must be provided in writing a minimum of two (2) Business Days prior to the planned suspension of work. Failure of the Contractor to provide adequate notice, in the opinion of the Contract Administrator, may result in Working Days being incurred.

(c) During these periods, the Site must be made secure, roadways completely operational, and all existing facilities and work in progress be protected from weather or other potentially harmful effects.

(d) Upon recommencement of site activities after long breaks (greater than 1 month), the Contractor shall provide an updated schedule and notification to the Contract Administrator a minimum of five (5) Business Days prior to recommencement of work.

(e) No changes to the Contract completion dates resulting from suspension of contract time as described herein will be considered.

D17.8 No additional costs associated with demobilization and remobilization resulting from suspension of contract time will be considered.

D18. SUBSTANTIAL PERFORMANCE

D18.1 The Contractor shall achieve Substantial Performance within twenty-five (25) consecutive Working Days of the commencement of the Work as specified in D15, or by December 18, 2020, whichever comes first.

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.

D18.4 The Working Days identified in D18.1 does not include contract time associated with the provisional work for asbestos abatement (E11). If asbestos abatement is required, the Contractor shall provide a schedule for the proposed asbestos abatement work in accordance with E11 and C7 of the General Conditions. The number of allowable Working Days will be increased in accordance with the accepted schedule for the asbestos abatement work.

D19. TOTAL PERFORMANCE

D19.1 The Contractor shall achieve Total Performance within thirty-five (35) consecutive Working Days of the commencement of the Work as specified in D15, or by June 30, 2021, whichever comes first.

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.

D19.4 The Working Days identified in D19.1 does not include contract time associated with the provisional work for asbestos abatement (E11). If asbestos abatement is required, the Contractor shall provide a schedule for the proposed asbestos abatement work in accordance with E11 and C7 of the General Conditions. The number of allowable Working Days will be increased in accordance with the accepted schedule for the asbestos abatement work.

D20. LIQUIDATED DAMAGES

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

(a) Substantial Performance – two thousand dollars ($2,000.00);

(b) 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 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 and 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. If the Contractor declares that 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 D16 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.

CONTROL OF WORK

D22. JOB MEETINGS

D22.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D22.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D23. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D23.1 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).

D24. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D24.1 Further to B13.7, 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 B13.7.

MEASUREMENT AND PAYMENT

D25. PAYMENT

D25.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D26. WARRANTY

D26.1 Warranty is as stated in C13.

THIRD PARTY AGREEMENTS

D27. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D27.1 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.

D27.2 Further to D27.1, in the event that the obligations in D27 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.

D27.3 For the purposes of D27:

(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.

D27.4 Modified Insurance Requirements

D27.4.1 If not already required under the insurance requirements identified in D10, 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.

D27.4.2 If not already required under the insurance requirements identified in D10, 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.

D27.4.3 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.

D27.4.4 Further to D10.3, 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.

D27.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D27.5 Indemnification By Contractor

D27.5.1 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.

D27.6 Records Retention and Audits

D27.6.1 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.

D27.6.2 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 D27.6.1 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.

D27.7 Other Obligations

D27.7.1 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.

D27.7.2 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.

D27.7.3 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.

D27.7.4 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.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 347-2020

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

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 D11)

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. 347-2020

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

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

    (i) 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;

(ii) 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;

(iii) 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 D12)

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

Name	Address

FORM K: EQUIPMENT
(See D13)

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM L: CONTRACTOR EXPERIENCE
(See B13)

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

Attach. additional resumes and documents as required. Indicate whether Projects/Project Personnel are for Contractor or Subcontractor, and if applicable include name of Subcontractor.

Project References:

Project Client/Contact: _____
(Name)

_____
(Address)

_____
(phone) (email)

Year	Description of Project, including type of pipe	Value

Project References:

Project Client/Contact: _____
(Name)

_____
(Address)

_____
(phone) (email)

Year	Description of Project, including type of pipe	Value

FORM L: CONTRACTOR EXPERIENCE
(See B13)

KILDONAN-REDWOOD FEEDER MAIN CROSSING REHABILITATION

Project Personnel:

Name and Title:_____
(Name)

Qualifications: (attach resume and fill out information below)

Year	Description of Past Project	For Whom Work Was Performed	Value

Project Personnel:

Name and Title: _____
(Name)

Qualifications: (attach resume and fill out information below)

Year	Description of Past Project	For Whom Work Was Performed	Value

Project Personnel:

Name and Title: _____
(Name)

Qualifications: (attach resume and fill out information below)

Year	Description of Past Project	For Whom Work Was Performed	Value

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:

Appendix No.	Appendix Title
A	Record Drawings
B	Site Photos
C	PICA Inspection Report
D	AECOM Tunnel Inspection Report
E	AECOM Confined Space Safe Work Procedures

Drawing No.	Drawing Name/Title
1-0798E-D0001-001	Cover Sheet
1-0798E-C0001-001	Plan/Profile
1-0798E-C0002-001	Details

GENERAL REQUIREMENTS

E2. CONFINED SPACE ENTRY AND INSPECTION SUPPORT

E2.1 Description

(a) This specification covers provision of confined entry and access support for specialized inspection contractors and inspection personnel.

E2.2 General

E2.2.1 The Contractor shall be aware that Hydrogen Sulphide Gas may be present in all underground structures in concentrations sufficient to cause serious harm or death to personnel who are not using adequate Personal Protective Equipment.

E2.2.2 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 Space Entry Work and in particular the requirements for conducting hazard/risk assessments and providing personal protective equipment (PPE).

E2.2.3 Consultants and City personnel require dedicated confined entry support services for the purposes of inspection. The Contractor shall provide confined space support as specified

herein throughout the course of the work and during both the Substantial and Total Performance inspections.

E2.3 Methods

E2.3.1 Be fully responsible for confined entry access on site, in accordance to Manitoba Workplace Health and Safety Regulation 217/2006 and subsequent amendments.

E2.3.2 Support services will be required to support one pipeline crossing (one inspection crew) at a time. Each crossing will require support on each side of the river.

E2.3.3 Safety Personnel shall be dedicated to confined entry access when inspection personnel are in confirmed areas.

E2.3.4 Maintain confined entry permit logs.

E2.3.5 Hazard Assessment

(a) In conjunction with securing the site and obtaining underground clearances, the Contractor shall conduct a hazard assessment for each site requiring work within a confined space. The assessment shall identify and evaluate the hazards, including but not be limited to review of the following as it pertains to the work to be performed:

(i) nature of the work;

(ii) structural condition of the existing structure; and,

(iii) atmospheric conditions in the structure.

(b) The hazard assessment shall be based on the Contractors review of structures and external conditions. Prior to the inspection, the Contractor shall conduct the necessary atmospheric monitoring of the affected structures to establish acceptable entry conditions.

E2.3.6 Safe Work Plan

(a) Subsequent to performing a hazard assessment the Contractor shall develop a safe work plan to address the potential hazards associated with each site. In addition to addressing the potential hazards the safe work plan shall address but not be limited to the following:

(i) guidelines for confined space entry work established by The Manitoba Workplace Safety and Health Act;

(ii) provision for emergency response;

(iii) training and duties for entry personnel;

(iv) rescue and emergency services;

(v) requirement for purging, ingesting, flushing and/or continuous ventilation to eliminate or control atmospheric hazards;

(vi) requirement for and provision of supplied air;

(vii) communication between members of the repair crew in the pipe/trench and on the ground’s surface;

(viii) current and forecasted weather conditions;

(ix) provision of back-up equipment;

(x) method of ingress into the structure; and,

(xi) method of egress out of the structure.

(b) The Contactor shall not enter the structures to begin the work until they have completed a hazard assessment and safe work plan for the specific repair and reviewed the plans with their designated safety officer for acceptance. The safe work plan procedures and practices shall conform to all federal, provincial and municipal codes, regulations and guidelines including Manitoba Workplace Safety and Health Regulations.

E2.3.7 Third Party Inspections

(a) The Contractor's safe work plan and confined space entry procedures for inspections involving AECOM or City personnel shall meet or exceed all requirements outlined in AECOM's Safe Work Procedure, attached in Appendix E and those of the Inspection Contractor.

(b) The Contractor shall provide confined space support for third party inspections by AECOM and City personal. AECOM and City personal will provide personal PPE. Support shall include but is not limited to:

(i) Furnishing all confined space entry documentation and permits. Copies of the signed and closed out permits shall be provided to the Contract Administrator within five (5) Business Days of the confined space entry;

(ii) Provision of an attendant and supervisor dedicated to the confined space entry;

(iii) Provision of a retrieval tripod, complete with retractable winch line;

(iv) Provision of confined space harnesses. Harnesses shall be certified in accordance with the manufacturer's recommendations;

(v) Provision of atmospheric monitors for each entrant. Atmospheric monitors shall be calibrated and tested in accordance with the manufacturer's recommendations; and,

(vi) The Contractor shall complete and document atmospheric monitoring prior to and during entry in accordance with submitted confined space procedures.

(c) The Contractor shall have a continuous air ventilation within the tunnel and tunnel shaft utilizing the existing ventilation system or similar providing fresh air to the end of the tunnel.

(d) Inspections may be delayed or postponed where onsite confined space procedures, hazard mitigation measures, or confined space entry support do not meet the Contractor's submitted and accepted safe work plan and procedures until such a time that discrepancies have been addressed to the satisfaction of the entrants. Claims for delays resulting from improper confined space operations will not be considered.

E2.4 Measurement and Payment

(a) Confined entry support will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E3. ENVIRONMENTAL PROTECTION

E3.1 The Contractor shall be aware that feeder mains and associated infrastructure is for potable water and no contamination by fuel, chemicals, etc. shall be permitted at any time. Fuels or chemicals shall not be stored within 30 metres of the existing chambers, excavations, etc.

E3.2 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.

E3.3 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

E3.3.1 Federal

(a) Canadian Environmental Protection Act (CEPA) c.16;

(b) Canadian Environmental Assessment Act (CEAA) c.37;

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

(d) Migratory Birds Convention Act, 1994

E3.3.2 Provincial

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

(b) The Endangered Species Act E111;

(c) The Environment Act c.E125;

(d) The Fire Prevention Act F80;

(e) The Manitoba Heritage Resources Act H39.1;

(f) The Manitoba Noxious Weeds Act N110;

(g) The Manitoba Nuisance Act N120;

(h) The Public Health Act c.P210;

(i) The Workplace Safety and Health Act W210; and

(j) And current applicable associated regulations.

E3.3.3 Municipal

(a) The City of Winnipeg By-law no. 1/2008;

(b) The City of Winnipeg Waterway By-Law no. 5888/92; and

(c) Other applicable Acts, Regulations and By-laws.

E3.4 The Contractor is advised that the following environmental protection measures apply to the Work.

E3.4.1 Materials Handling and Storage

(a) Construction materials and debris shall be prevented from entering drainage pipes or channels.

(b) Construction materials and debris shall also be prevented from accumulating on local roadways and sidewalks when tracked out of the Site by trucks hauling excavated materials.

(c) The Contractor shall provide on-Site measures to mitigate the tracking of sediment off-Site and therefore reduce the amount of street cleaning required. These measures may take the form of a truck wheel wash (automated or manually operated) or other measures as approved by the Contract Administrator.

E3.4.2 Fuel Handling and Storage

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

(b) 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.

(c) 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.

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

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

(f) 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.

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

(h) 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.

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

E3.4.3 Waste Handling and Disposal

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

(b) 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.

(c) 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 may require special disposal methods (see SC:21.4 D).

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

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

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

(g) Run-off from a waste storage area shall not be allowed to cause siltation of a watercourse.

(h) 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.

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

E3.4.4 Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

(c) 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.

(d) Different waste streams shall not be mixed.

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

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

(g) 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.

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

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

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

(k) Run-off from a dangerous goods/hazardous waste storage area shall not be allowed to cause siltation of a watercourse.

(l) 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.

E3.4.5 Emergency Response

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

(b) The Contractor shall report all major spills of petroleum products or other hazardous substances with the potential for impacting the environment and threat to human health and safety to the Contract Administrator and Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency telephone phone number (204) 945-4888. The Contract Administrator shall also be notified.

(c) 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.

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

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

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

(iii) Assess situation and gather information on the status of the situation, noting:
- personnel on site
- cause and effect of spill
- estimated extent of damage
- amount and type of material involved
- proximity to waterways and the Aqueduct

(iv) If safe to do so, try to stop the dispersion or flow of spill material:
- approach from upwind
- stop or reduce leak if safe to do so
- dike spill material with dry, inert sorbent material or dry clay soil or sand
- prevent spill material from entering waterways and utilities by diking
- prevent spill material from entering Aqueduct manholes and other openings by covering with rubber spill mats or diking

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

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

(f) 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.

(g) 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.

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

E3.5 Vegetation

(a) Vegetation shall not be disturbed without written permission of the Contract Administrator. The Contractor shall protect plants which may be at risk of accidental damage. Such measures may include protective fencing or signage.

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

(c) All landowners adjacent to the area of application of herbicides or pesticides shall be notified prior to the Work.

(d) Trees and shrubs shall not be felled into watercourses.

(e) Areas where vegetation is removed during clearing, construction, and decommissioning activities, shall be revegetated as soon as possible in accordance the requirements outlined herein, or as directed by the Contract Administrator.

E3.6 Measurement and Payment

(a) The work covered in this section will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E4. SHOP DRAWINGS

E4.1 Description

(a) This Specification shall revise, amend, and supplement the requirements of CW 1110 of the City of Winnipeg's Standard Construction Specifications.

E4.2 Submit all Shop Drawings in accordance with CW 1110 except as modified herein.

E4.3 The Contractor shall submit specified Shop Drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for Engineering review.

E4.4 Submit Shop Drawing submissions within five (5) Calendar days of a request as indicated in E4.8.1 or receipt of Notice of Award in accordance with B19, whichever is earlier.

E4.5 Allow for a five (5) Calendar day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.

E4.6 Shop Drawings not meeting the requirements of CW 1110 or the requirements specified herein will be returned to the Contractor without review for resubmission.

E4.7 Review of Shop Drawings by the Contract Administrator will be limited two (2) reviews per Shop Drawing. This shall include a review of the initial submission and a review of the revised submission. Costs associated with subsequent reviews will be billed of the Contractor.

E4.8 Expedited Shop Drawings

E4.8.1 Further to CW 1110, in order to expedite Shop Drawings with critical timelines, the lowest responsive Bidder, as outlined in B18, will be required, after receiving a written request from the Contract Administrator, to arrange for the preparation of Shop Drawings for the following items with critical timelines:

(a) Pipeline cleaning protocols

(b) CIPP design submission

(c) CIPP liner termination submission

E4.8.2 Schedule to submit Shop Drawings listed in E4.8.1within five (5) Business Days of a request as indicated in E4.4 or receipt of Notice of Award in accordance with B19.

E4.9 Measurement and Payment

(a) The provision of Shop Drawings shall be considered incidental to the Work and will not be measured for payment and no additional payment will be made.

E5. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

(a) This Specification shall govern Mobilization and Demobilization from site.

E5.2 Measurement and Payment

E5.2.1 Mobilization and Demobilization

(a) Mobilization and demobilization will be measured on a lump sum basis and paid for at the Contract Lump Sum Price for “Mobilization and Demobilization”. Payment for Mobilization and demobilization shall include all costs associated with mobilization and demobilization, site set up, and cleanup. Payment will be made on the following schedule:

(b) 50% payment of the Mobilization and Demobilization lump sum price will be paid once lining crews arrive on site to commence cleaning and hot pipe preparation works.

(c) The remaining 50% of the Mobilization and Demobilization lump sum price will be paid subsequent to handover of the feeder main to the City for return to service, completion of surface works (restoration excluded), and site cleanup.

E6. SITE ACCESS

E6.1 Site Access Requirement and Constraints

(a) Kildonan-Redwood Feeder Main (Redwood Ave / Harry Lazarenko Bridge from Main Street to Glenwood Cres)

(i) Access to chambers on both sides of the river is by local streets.

(ii) The Contractor shall develop site access as required to complete the work.

(iii) The Contractor shall keep construction activities within the City of Winnipeg easement (west chamber) and right of way (east chamber).

(iv) Maintain access to all private approaches.

(v) Access requirements also include but are not limited to:

(i) Excavation to top of valve chambers.

(ii) Removal of concrete roof panels.

(vi) Removal of the existing guardrail may be required on the west side of the Harry Lazarenko Bridge to facilitate site access. If removed the Contractor shall install traffic barriers to protect the exposed end of the traffic barrier and worksite.

(vii) The Contractor may utilize the two westbound lanes on Redwood Ave (west of the bridge) for a work and laydown area in accordance with E10.

(viii) The Contractor is permitted a 48 hr closure of Redwood Ave and Hespeler Ave to permit liner installation in accordance with E10.

(ix) Contractor shall be responsible for providing and maintaining all necessary traffic control in accordance with E10 and the City of Winnipeg Manual of Temporary Traffic Control.

(b) The Contractor shall exercise caution to prevent damage to existing pavements, curbs, sidewalks, grassed areas, and trees. Surface restoration of damaged areas caused by the Contractor outside of the designated construction areas shall be the responsibility of the Contractor.

(c) Where site access utilizes multi-use pathways, the pathways must remain open to public use. Ensure adequate delineation, fencing, flagging or other measures are used to protect public.

(d) Where tracked equipment is utilized, protect pathways from damage with planking. No payment will be made for damages caused by equipment tracks on unprotected surfaces.

(e) Where site access utilizes grassed right-of-ways, limit access for heavy equipment to a single pathway directly from street to work area. Protect grassed areas with planking or other measures to minimize rutting and damage.

(f) Laydown and storage areas shall be staged away from areas prone to damage.

(g) The Contractor shall maintain access to all businesses during business hours, except where written authorization has been provided by the business.

(h) The Contractor is responsible for maintaining safe vehicular traffic through their work site. The Contractor shall rectify any unsafe conditions immediately upon notification. This could include but is not limited to providing flag persons, clearing debris and snow from sites, moving equipment, and erecting additional signage.

E6.2 Measurement and Payment

(a) Development of site access will be considered incidental to “Pipeline Access” and will not be measured for payment. No separate payment will be made.

E7. EXCAVATION, SHORING, AND BACKFILL

E7.1 Description

(a) This Specification covers the requirements for excavations and backfilling of trenches, pipelines, and structures.

E7.2 Submittals

(a) Shop Drawings for all excavation shoring (where required) shall be prepared and submitted a minimum of five (5) Business Days prior to undertaking the excavation and shoring installation. Where required by Workplace Safety and Health Regulation, shoring Shop Drawings shall be sealed by a Professional Engineer, registered in the Province of Manitoba, experienced in the design of excavation shoring systems.

E7.3 Approvals

(a) City of Winnipeg Waterways approvals have been submitted and will be in place prior to the start of construction.

E7.4 Shoring Design

(a) Shoring shall be provided for excavations in accordance with CW 2030.

(b) Excavation shoring shall be designed to accommodate the installation of all pipe and fittings.

(c) Where long term shoring for excavations is required provide stamped Shop Drawings in accordance with E7.2.

(d) All shoring systems shall comply with Manitoba Workplace Safety and Health requirements.

E7.5 Excavation

(a) Material from excavations shall not be stockpiled on the riverbank, or within 30 metres of the top of the riverbank.

(b) Granular materials, pipe bedding, and other materials shall not be stockpiled on the riverbank, or within 30 metres of the top of the riverbank.

(c) Materials shall not be stockpiled over pipelines.

(d) Excess excavation material from excavations shall be disposed of off-site.

(e) Granular bedding in the vicinity of existing pipelines shall be dewatered and stabilized prior to undermining pipes to prevent loss of granular pipe foundation.

(f) Carefully excavate to expose existing pipelines. Excavation within 1.0 m of the pipe shall be done using soft dig or hand excavation methods to prevent damage to the pipe.

(g) The Contractor shall undertake all efforts to prevent freezing of soils underlying existing pipelines, bedding and backfilling will not be permitted overtop of frozen soils. Excavations left open when nighttime atmospheric temperatures are expected to drop below 0°C shall be horded and heated as required to keep soils and pipelines from freezing.

(h) See E8 for additional restrictions when working in close proximity to feeder mains.

(i) Provide heating and hoarding around the lower portion of the excavation and pipe during freezing conditions.

E7.6 Backfill

(a) Backfill within 1 m of existing and proposed pavements shall be completed to CW 2030, Class 2 standards.

(b) Backfill under paths and walkways shall be completed to CW 2030, Class 2 standards.

(c) Backfill within 1 metre of existing concrete structures shall be completed with free draining pit run granular material to CW 2030, Class 2 standards. The top 600 millimetres of the backfill adjacent to concrete structures shall be insitu clay material completed to CW 2030, Class 4 standards.

(d) All other areas shall be backfilled with a Class 4 backfill unless otherwise noted on the Drawings.

(e) The Contractor shall undertake all efforts to prevent excavated material intended for backfilling from freezing. Backfilling with frozen materials will not be permitted.

E7.7 Measurement and Payment

(a) Excavation, shoring, and backfilling for excavations will be considered incidental to “Pipeline Access” and will not be measured for payment. No separate payment will be made.

E8. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO FEEDER MAINS

E8.1 Description

E8.1.1 This Section details operating constraints for all work to be carried out in close proximity to the City feeder mains and other critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centerline of the feeder main, within 5 m of valve chambers and other appurtenances, and any other infrastructure identified below.

E8.1.2 The following shall be considered critical pipelines and water infrastructure for this project:

(a) 600 mm Kildonan-Redwood Feeder Main Crossing

(b) 600 mm PCCP Kildonan Feeder Main (West of the Harry Lazarenko Bridge)

(c) 400 mm AC Feeder Main (West of the Harry Lazarenko Bridge)

(d) Feeder main valve chambers shown on the Drawings.

E8.2 General Considerations for Work in Close Proximity to Feeder Mains

E8.2.1 Feeder mains are a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to feeder mains shall be undertaken with an abundance of caution. Feeder mains cannot typically be taken out of service for extended periods to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences.

E8.2.2 Work around feeder mains shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not

subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E8.2.3 Large diameter pressure pipe generally has limited ability to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters. PCCP typically fails in a non-ductile mode and has the potential to cause extensive consequential damage to infrastructure if failure should occur.

E8.2.4 Construction in close proximity to critical infrastructure shall not commence until both the equipment and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.

E8.3 Submittals

E8.3.1 Submit proposed construction equipment specifications to the Contract Administrator for review a minimum of five (5) Business Days prior to construction. The equipment submission shall include:

(a) equipment operating and payload weights;

(b) equipment dimensions, including wheel or track base, track length or axle spacing, track widths or wheel configurations; and

(c) load distributions in the intended operating configuration.

E8.3.2 Submit a construction method statement to the Contract Administrator a minimum of five (5) business days prior to construction. The construction method statement shall contain the following minimum information:

(a) proposed construction plan including excavation locations, haul routes, excavation equipment locations, and loading positions.

(b) excavation plans, including shoring designs, for excavations occurring in close proximity to feeder mains (within 5 m horizontal of the pipe's centerline) where the excavation to be extended below the top of the feeder mains embedment zone (150 mm above the pipe).

(c) any other pertinent information required to accurately describe the construction activities in close proximity to the feeder main and permit the Contract Administrator to review the proposed construction plans.

E8.3.3 Submit the following documentation for inclusion in the City's feeder main shutdown protocol for each planned feeder main shutdown a minimum of fifteen (15) Business Days prior to the proposed shutdown and the Contractor should allow for a ten (10) Business Day review period by the City once accepted by the Contract Administrator:

(a) A detailed schedule for the work, including a step by step list of a tasks to be undertaken during the shutdown.

(b) A contingency plan for any problems, issues, or unforeseen circumstance that might occur. The contingency plan shall include a detailed procedure and schedule for putting the feeder main back into service on an emergency basis.

(c) Check list of equipment, materials, tools required to complete the work that need to be on site prior to undertaking the shutdown.

E8.4 Feeder Main Shutdowns

(a) Isolation of the feeder main crossings will be completed by City forces using mainline valves and secondary valves wherever possible.

(b) The Contractor shall be responsible for dewatering the feeder main.

(c) Refer to D16.1 for feeder main shutdown restrictions. Work shall be scheduled to minimize the duration of all shutdowns.

E8.5 Lock-out and Tag-out Procedures

E8.5.1 The City of Winnipeg will endeavor to provide redundant valve closures (double blocking) of pressurized pipelines that enter the work space where possible. However, there are locations within the system where it is impractical to provide double blocking without widespread service disruption. Where regional water system network does not allow double blocking, non-redundant valve closures (single blocking) will be provided.

E8.5.2 At locations where only single valve blocking is practical, additional safety measures and monitoring will be required in order to provide a safe work environment for employees. Development of adequate safety plans in accordance to the Workplace Safety and Health Act and Regulation 217/06 are the responsibility of the Contractor, but as a minimum shall include:

(a) Provision of adequate egress from confined spaces including removal of removable roof slabs and manhole covers, and provision of ladders and other means of site exit

(b) Use of body harnesses and safety hoisting equipment at all times when pressurized systems are disassembled and protected only by single block valves.

(c) Monitor and assess water leakage in closed system prior to disassembly of system. Monitor water leakage rate and advise Contract Administrator immediately of change in inflow rates. Evacuate confined space if necessary.

E8.5.3 The Contractor, City of Winnipeg Water and Waste Department, and Contract Administrator will all be required to lock out all valves closed in order to facilitate this work. Where site access and lockout space on system valves is limited, the following lockout/tag out procedures will be implemented;

(a) Lockout locations for valves will be identified by the City.

(b) City of Winnipeg will provide a single lock, chains and other devices to adequately secure valves within pits and chambers. The Contractor has the right to inspect the installation and satisfy that the lockout system is adequate. All locks utilized will be commonly keyed.

(c) Key(s) for single locked valves will be placed in secure lock box at the site. City staff, Contractors, and Contract Administrator will place personal/company locks complete with identification and tag out information on this lock box.

(d) Key(s) placed within the secure lock box will not be removed until all City staff, Contractor, and Contract Administrator locks have been removed from the lock box, and verified that the work is completed.

(e) City staff will then unlock all valves, and will commence with restoration of the systems to service.

E8.6 Pre-Work, Planning and General Execution

E8.6.1 No work shall commence in close proximity to feeder mains, chambers, and critical infrastructure until the equipment specifications and construction method statement have been submitted and accepted, and feeder main locations have been clearly delineated in the field. Work over feeder mains shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications on the pipe.

E8.6.2 Contact the City of Winnipeg Water and Waste Department, Construction Services Coordinator prior to construction.

E8.6.3 Locate feeder mains and confirm their position horizontally and vertically at the proposed the following locations prior to undertaking work in close proximity to the identified feeder mains. Note, exact locations to be identified in the field.

E8.6.4 Visually delineate all critical infrastructure identified herein on Site by use of paint, staking/flagging, construction fencing, snow fencing, or other suitable methods.

E8.6.5 Only utilize construction practices and procedures that do not impart excessive vibratory loads on feeder mains and chambers or that would cause settlement of the subgrade below feeder mains and critical pipelines.

E8.6.6 Where the existing road structure must be removed, crossing of critical infrastructure shall be prohibited from the time the existing roadway structure is removed until the completion of granular base construction. At all times prior to completion of final paving; reduce equipment speeds to levels that minimize the effects of impact loading to the critical infrastructure.

E8.6.7 Only equipment and construction practices stipulated in the accepted construction method statement and the supplemental requirements noted herein may be utilized in close proximity to feeder mains, chambers, and other critical infrastructure identified herein.

E8.6.8 Construction operations should be staged in such a manner as to limit multiple construction loads at one time, (e.g., offset crossings sufficiently from each other, rollers should remain a sufficient distance behind spreaders to limit loads. A reasonable offset distance is 3 m between loads).

E8.6.9 Granular material, construction material, soil, and/or other material shall not be stockpiled on the pipelines or within 5 m of any feeder main, valve chamber, or other critical infrastructure identified herein.

E8.6.10 The Contractor shall ensure that all crew members understand and observe the requirements of working near feeder mains, valve chambers, and critical infrastructure. Prior to commencement of on-Site work, the Contractor shall jointly conduct an orientation meeting with the Contract Administrator, all superintendents, foreman, and heavy equipment operators to make all workers on the Site fully cognizant of the limitations of altered loading on, the ramifications of inadvertent damage to, and the constraints associated with work in close proximity to feeder mains and critical pipelines. New personnel introduced after commencement of the Project need to be formally orientated as outlined herein. It is recommended that restrictions associated with the crossing, consistent with the Contractor's submitted method statement be posted on Site and near the crossing.

E8.7 Demolition, Excavation, and Shoring

E8.7.1 Use of pneumatic concrete breakers within 3 m of a feeder main, valve chamber, or critical pipeline is prohibited. Pavement shall be full depth sawcut and carefully removed. Use of hand held jackhammers for pavement removal will be allowed.

E8.7.2 Offset excavation equipment a minimum of 3 m from the centerline of critical pipelines when undertaking excavations where there is less than 2.4 m of earth cover over the pipeline.

E8.7.3 Utilize only smooth edged excavation buckets, soft excavation, or hand excavation techniques where there is less than 1.5 m of earth cover over the pipeline. Where there is less than 1.0 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation or soft excavation methods.

E8.7.4 Equipment should not be allowed to operate while positioned directly over a feeder main or critical pipeline except were permitted herein, outlined in the reviewed and accepted construction method statement.

E8.7.5 Excavations within 3 m of the outside edge of a feeder main (hydrovac holes for confirming trenchless installations excluded) and which extend below obvert of the feeder main shall utilize shoring methods that precludes the movement of native in-situ soils (i.e. a tight shoring system).

E8.7.6 Pre-bore all piles to below the invert of critical infrastructure within 5 m (horizontally) of the pipeline's outside edge.

E8.7.7 Offset pile driving equipment a minimum of 3 m (horizontally) from the centerline of the pipeline during piling operations.

E8.8 Subgrade Construction

E8.8.1 Subgrade and backfill compaction within 3 metres (horizontal) of a critical pipeline or valve chamber shall be limited to non-vibratory methods only. Small walk behind vibratory packers will be permitted.

E8.8.2 Subgrade, sub-base and base course construction shall be kept in a rut free condition at all times. Construction equipment is prohibited from crossing pipelines if the grade is insufficient to support the equipment without rutting.

E8.8.3 Subgrade conditions should be inspected by personnel with competent geotechnical experience (e.g. ability to adequately visually classify soils and competency of subgrade, subbase, and base course materials). In the event of encountering unsuitable subgrade materials above the feeder main, proposed design revisions shall be submitted to this office for review to obtain approval from the Water and Waste Department relative to any change in conditions.

E8.8.4 Fill material shall not be dumped directly on pipelines but shall be stockpiled outside the limits noted in these recommendations and shall be carefully bladed in-place

E8.8.5 Only use compaction equipment approved by the contract administrator to compact fill materials above critical pipelines. Compaction of fill materials shall be completed using static methods only, no vibratory compaction will be allowed within the limits noted in these recommendations.

E8.8.6 Construction operations shall be staged to minimize the time period between excavation to subgrade and placement of granular subbase materials. Should bare subgrade be left overnight, measures shall be implemented to protect the subgrade against inadvertent travel over it and to minimize the impact of wet weather.

E8.9 Subbase and Base Course Construction

E8.9.1 Subbase or base course materials shall not be dumped directly on pipelines but shall be stockpiled outside limits noted in these recommendations and shall be carefully bladed in-place.

E8.9.2 Subbase compaction within 3 m horizontal of the centerline of a critical pipeline shall be either carried out by static methods (without vibration) or with smaller approved equipment such as hand held plate packers or smaller roller equipment.

E8.10 Paving

E8.10.1 When constructing asphalt pavements only non-vibratory compaction should be used within 3 m (horizontal) of the center of critical pipelines.

E8.11 Measurement and Payment

(a) Work covered in this section will be considered incidental to “Pipeline Access” and will not be measured for payment. No separate payment will be made.

E9. WATER SUPPLY

E9.1 Further to specifications CW 1120, Section 3.1, CW 2140 and CW 2145, water supply for the Work may be taken from City of Winnipeg hydrants in accordance with the following:

(a) Only hydrants approved by WSD shall be used for water supply.

(b) The Contractor shall supply and use a Backflow Protection Arrangement as shown on Standard Drawing SD-019 when taking water from City hydrants. Alternatively, the Contractor may rent the Backflow Protection Arrangement from the Water Services Division (WSD) if available. WSD will supply a meter and locks for the Backflow Protection Arrangement.

(c) The Contractor is permitted to turn approved hydrants on and off provided the Contractor has received training by the Water Services Division and the turn-ons and turn-offs are done in the presence of the Contract Administrator.

(d) Hydrants approved for use shall be considered to be “in the Contractor’s control” from the time the City has turned the hydrant on until the Contractor has notified the City the hydrant is no longer being used and the meter box has been removed.

(e) Between November 1 and April 30 of any year the Contractor shall take all necessary precautions to prevent freezing of hydrants and related appurtenances for hydrants in their control and shall be responsible to pump out hydrants turned off by Emergency Services. Heating and hoarding of hydrants will be required by the Contractor.

(f) If a hydrant or appurtenance is damaged due to freezing or improper turn-on or turn-off procedures while in the Contractor’s control, WSD will assess the damage and determine if WSD will repair the damage or if the Contractor will be responsible to repair the damage. Costs for repairs completed by WSD will be deducted from payments owing the Contractor. Repairs completed by the Contractor will be at the Contractor’s expense.

(g) Erect and maintain signage (bump signs) warning oncoming traffic of hose crossings to the satisfaction of the Contract Administrator and the Manual of Temporary Traffic Control. Construct ramps as shown on attached Drawing D-8211.

(h) Direct hook-up of pipeline flushing equipment to a hydrant is not permitted unless approved by the Contract Administrator.

(i) WSD may instruct the Contractor to make other arrangements for hydrant turn-ons and turn-offs.

E9.2 Measurement and Payment

(a) The supply of the Backflow Protection Arrangement or rental of same from WSD will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

(b) All costs associated with heating and hoarding will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

(c) Further to Section 3.7 of CW 1120, charges incurred for the permit and water meters shall be paid for by the Contractor when taken out. The Contractor shall forward the invoice to the Contract Administrator for reimbursement. The billing for water usage sent to the Contractor shall be forwarded to the Contract Administrator for payment. The Bid Opportunity number shall be noted on each permit.

E10. TRAFFIC MANAGEMENT

E10.1 Further to Section 3.7 of CW 1130 of the General Requirements the Contractor shall be responsible to redirect and maintain traffic with appropriate signing in accordance with The City of Winnipeg, "Manual of Temporary Traffic Control in Work Areas on City Streets” at all times during construction.

E10.2 Maintain access for approaches, driveways, public lanes and crossing streets for all locations.

E10.3 The Contractor shall maintain access to all businesses during business hours, except where written authorization has been provided by the business.

E10.4 The Contractor shall maintain access to all schools, community centres, and other public buildings at all times.

E10.5 Further to Section 3.6 of CW 1130 of the General Requirements, the Contractor shall maintain safe pedestrian crossings at intersections at all times. If possible, only one pedestrian crossing at an intersection is to be blocked by construction at any one time. If more than one pedestrian crossing is blocked by construction at an intersection at the same time the Contractor shall provide flag persons to safely escort pedestrians across the intersection. The Contractor shall

leave pedestrian crossing locations safe and free of equipment that may hamper pedestrians when no construction activities are being performed at a particular crossing location.

E10.6 Further to Clause 3.7 of CW 1130 of the General Requirements, should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E10.7 The Contractor shall not park company or private vehicles inside the barricaded work zone in a manner that will block sightlines for vehicles and pedestrians approaching and crossing intersections.

E10.8 The Contractor is responsible for maintaining safe vehicular and pedestrian traffic through their work site as identified herein. The Contractor shall rectify any unsafe conditions immediately upon notification. This could include but is not limited to, providing flag persons, clearing debris and snow from sites, moving equipment, and erecting additional signage.

E10.9 Regional Street Lane Closures

E10.9.1 The Contractor shall submit all regional lane closure requests to the Contract Administrator a minimum of five (5) Business Days prior to the planned work. Requests for regional lane closures shall include all required information for submission required by the City's online request form. A link to the form can be found here: (http://www.winnipeg.ca/publicworks/trafficcontrol/laneclosures/LaneClosuresMap.asp).

E10.10 Residential Streets

(a) Where complete street closures are required, the Contractor shall provide notice of complete street shutdowns complete with dates and duration a minimum of five (5) Business Days prior to the street closures.

E10.11 Notwithstanding the requirements noted herein and CW 1130, the Contractor shall maintain the following minimum site specific traffic control requirements:

(a) The Contractor may utilize the two westbound lanes on Redwood Ave for the duration of construction. The Contractor should maintain two lanes of traffic (one in each direction) at all times on Redwood Ave and Hespeler Ave.

(b) Notwithstanding E10.11(a) the Contractor may request one (1) directional or complete closure of Redwood Ave/Hespeler Ave to facilitate installation and curing of the CIPP liner in accordance with the following:

(i) The Contractor shall provide written notification a minimum of twelve (12) Business Days prior to the required shutdown.

(ii) Traffic control for the directional or complete road closure will be completed by Traffic Services. All other traffic control shall be completed by the Contractor.

(iii) The maximum duration for the closure shall be 48 hrs.

(iv) The closure will only be permitted over a weekend period. No weekday directional or complete road closures will be permitted.

E10.12 Measurement and Payment

(a) Traffic management as outlined here will be considered incidental to the Work and will not be measured for payment. No separate payment will be made.

E11. PIPELINE MODIFICATIONS

E11.1 Description

(a) This Specification shall cover the modification of valve chambers and feeder mains as required for cleaning and inspection the river crossing pipelines.

E11.2 Description of Work:

E11.2.1 Piping and Chamber Rehabilitation and Modifications:

(a) See Drawings for details on required chamber and piping rehabilitation and modifications.

(b) Expose chambers and remove roof slabs as required.

(c) Disassemble and remove (as required) east valve chamber piping to facilitate feeder main rehabilitation. Reassemble upon completion of work.

(d) Disassemble and remove west tunnel shaft piping to facilitate feeder main rehabilitation. Reassemble upon completion of work.

(e) Sandblast and coat (exterior) and line (interior) existing 600 mm feeder main piping and fittings from the west tunnel shaft.

(f) Repair existing west tunnel shaft roof slab.

(g) Replace existing ventilation pipe hangers.

(h) Rehabilitate existing feeder main joints within the tunnel and install corrosion protection wrap.

(i) Sandblast and coat all steel components within the west tunnel and tunnel shaft.

E11.3 Submissions:

E11.3.1 Submit Shop Drawings for all permanent and temporarily installed fittings, valves, piping and couplings in accordance with E4.

E11.4 Products

E11.4.1 Fasteners

(a) Bolts for all direct bury flange connections shall be ASTM A307 or ASTM F568M, grade B.

(b) Nuts for all direct bury flange connections shall be ASTM A563 or ASTM A563M, grade B.

(c) Bolts for all sleeve style couplings and/or restraints shall be ASTM F593 or ASTM F738M, type 316 stainless steel.

(d) Nuts for all sleeve style couplings and/or restraints shall be ASTM F594 or ASTM F836M, type 316 stainless steel.

(e) Anti-seize compound shall be used on all bolts.

(f) Dielectric washers and sleeves meeting the requirements of E11.4.14 shall be used wherever stainless steel hardware is used on ferrous metal fittings.

(g) For flanged connections, bolt size, type and diameter shall be in accordance to AWWA C207. Bolt length suitable for coupling AWWA C207 Class D flange.

(h) All steel bolting hardware shall be liquid epoxy coated in accordance with AWWA C116, E11.4.13, and E11.5.4 after assembly.

(i) All buried flanged connections and flanged connections within the west tunnel shaft and tunnel shall be wrapped in a petrolatum tape coating system in accordance with E11.4.17.

E11.4.2 Flange Gaskets

(a) 3mm, full-faced, SBR rubber gaskets or neoprene in accordance with AWWA C207.

(b) Gaskets shall be one piece construction where possible.

(c) Segmented gaskets shall be constructed of a minimum number of segments and joints shall be of dovetailed construction, or other jointing methods approved by the Contract Administrator.

E11.4.3 Blind Flanges

(a) Steel blind flanges shall be AWWA C207 Class D.

(b) Cast and ductile blind flanges shall be ASME/ANSI B16.1 Class 125.

(c) Steel blind flanges to be fusion bonded epoxy coated in accordance with AWWA C213, E11.4.13, and E11.5.4.

(d) Cast and ductile blind flanges shall be fusion bonded epoxy coated in accordance with AWWA C116, E11.4.13, and E11.5.4.

E11.4.4 Ductile Iron Fittings

(a) Flanged ductile iron fittings conforming to AWWA C110.

(b) Fittings shall meet the following minimum criteria:

(i) Fittings shall be cement-mortar lined in accordance with AWWA C104.

(ii) Fittings to be liquid epoxy coated to AWWA C210, E11.4.12, and E11.5.4 or fusion bonded coated (interior and exterior) in accordance with AWWA C213, E11.4.13, and E11.5.4.

E11.4.5 Ductile Iron Pipe

(a) Ductile iron pipe conforming to AWWA C151.

(b) Pipe shall meet the following minimum criteria:

(i) Thickness Class 54 (minimum).

(ii) Pipe shall be cement-mortar lined in accordance with AWWA C104.

(iii) Pipe to be liquid epoxy coated in accordance with AWWA C210, E11.4.12, and E11.5.4 or fusion bonded coated (interior and exterior) in accordance with AWWA C213, E11.4.13, and E11.5.4.

E11.4.6 PVC Pipe and Fittings

(a) PVC pipe and fittings shall conform to AWWA C900 and CSA B137.3.

(b) Pipe and fittings shall meet the following minimum requirements:

(i) Shall have a dimension ratio (DR) of 18.

E11.4.7 Fabricated Steel Pipe and Fittings

(a) Steel pipe and fittings shall conform to AWWA C200, AWWA C208, and meet the following requirements:

(i) Minimum steel yield strength of 240 MPa (35,000 psi)

(ii) Minimum wall thickness of 9.5 mm for all sizes.

(iii) Pipe and Fittings shall be liquid epoxy lined (interior) and coated (exterior) in accordance with AWWA C210, E11.4.12, and E11.5.4 or fusion bonded coated (interior and exterior) in accordance with AWWA C213, E11.4.13, and E11.5.4.

(b) Welded steel patches on existing steel pipelines shall be a minimum thickness of 9.51 mm.

(c) Welded steel patches on existing pipelines shall be externally coated with a petrolatum tape wrap system in accordance with E11.4.17 and E11.5.6.

E11.4.8 Flanges for Pipe and Fittings

(a) Steel flanges shall conform to AWWA C207, minimum Class D Flange.

(b) Threaded ductile iron flanges shall conform to AWWA C115 ASME/ANSI B16.1 Class 125.

E11.4.9 Pipe Couplings and Flange Adaptors

(a) Pipe couplings shall conform to AWWA C219.

(b) Minimum requirements for sleeve couplings are:

(i) Center sleeve length: 250 mm

(ii) Center sleeve thickness for steel couplings: 9.5 mm

(iii) Couplings capable of accommodating up to 2 degrees deflection

(iv) Design pressure 150 psi

(c) Minimum requirements for flange adaptors:

(i) Flanges shall conform to AWWA C207, Class D or ASME/ANSI B16.1, Class 125.

(d) Restraining end rings shall be supplied where axial thrust restraint is specified on the Drawings. Restraint rings shall be specifically designed for the material type of the pipes being joined.

(e) All hardware shall be type 316 stainless steel in accordance with E11.4.1 and shall utilize di-electric insulating boots in accordance with E11.4.14.

(f) Couplings to be fusion bonded epoxy coated in accordance with E11.4.13 and E11.5.4.

(g) Buried pipe couplings shall be further protected against corrosion by wrapping the assembled coupler with petrolatum tape coating system in accordance with E11.4.17.

(h) All transition couplings larger than 300 mm in diameter, with differential outside pipe diameters greater than 25 mm, shall be restrained to prevent movement of the coupling due to differential thrust forces. Tie rods placed in compression for the purpose of restraining differential thrust forces shall be no longer than 150 mm and the Contractor must demonstrate they are capable of withstanding the applied forces.

E11.4.10 Grooved Joints and Couplings

(a) Direct grooved ends for ductile iron pipe shall conform to AWWA C606.

(b) Grooved flange adaptors shall be compatible with AWWA C606 grooved end joints. Confirm compatibility to existing piping and fittings.

(c) Grooved couplings and adaptors shall be constructed from ductile iron conforming to ASTM A536, grade 65-45-12.

(d) Grooved end fittings shall be epoxy coated in accordance with E11.4.12 or E11.4.13 and E11.5.4.

(e) Bolting hardware for grooved end fitting shall meet the requirements of E11.4.1 and be galvanised or liquid epoxy coated in accordance with AWWA C116, E11.4.13, and E11.5.4 after assembly.

(f) Approved manufacturer: Victaulic or approved equal in accordance with B7.

E11.4.11 Coatings

(a) Unless otherwise specified herein coatings for all metal chamber piping and fittings shall be a liquid epoxy meeting the requirements of E11.4.12. As an alternative to liquid epoxy, the contractor shall have the option to use fusion bonded epoxy in accordance with E11.4.13.

(b) Field-applied pipe coatings for above ground piping shall be a liquid epoxy meeting the requirements of E11.4.12.

E11.4.12 Liquid Epoxy Coatings

(a) Liquid epoxy coatings shall conform to AWWA C210.

(b) Liquid epoxy coatings shall be NSF 61 certified for immersion service in feeder main and water main pipelines.

(c) All coatings shall be applied in a minimum of two (2) or more layers (5 mils dry film thickness minimum each coat) for a minimum final coating dry film thickness of the greater of 16 mils or the thickness recommended by the manufacturer for immersion service.

(d) Interior pipe linings shall be a 100% solids liquid epoxy product. Approved products: Enviroline 230, Bar-Rust 234P, Specialty Polymer Coatings SP-7888, or approved equal in accordance with B7.

(e) Exterior coatings for all exposed steel, piping, valves, and actuators shall be Polyamide Epoxy. Approved products: Enviroline 230, Bar-Rust 234P, Specialty Polymer Coatings SP-7888, Tnemec Series 140F Pota-Pox Plus, Amerlock 2 or approved equal in accordance with B7.

(f) Submit product data for interior lining and exterior coating products.

E11.4.13 Fusion Bonded Epoxy Coatings

(a) Fusion bonded epoxy coatings shall conform to AWWA C213 for steel components and AWWA C116 for ductile iron fittings.

(b) Fusion bonded epoxies shall be NSF 61 certified for immersion service in feeder main and water main pipelines.

(c) The final minimum coating thickness shall be the greater of 16 mils or the thickness recommended by the manufacturer for immersion service.

(d) Submit product data for interior lining and exterior coating products.

E11.4.14 Flange Isolation Kits

(a) Flange isolation kits shall be used where noted, where dissimilar metal piping or fittings are joined.

(b) Flange isolation kits shall be to City of Winnipeg specification except as modified below.

(c) Each kit shall be double flange isolation kit with insulating sleeves and washers for each flange of the bolted connection.

(d) Bolt sleeves shall be comprised of G10 or G11 epoxy glass.

E11.4.15 Continuity Bonding

(a) Wires for continuity bonding shall be No.10 American Wire Gauge (AWG) 7-strand copper conductor with black TWU insulation.

(b) Thermite weld products shall be properly selected based on the wire size, pipe size and material.

(c) Thermite weld caps shall be constructed from 20 mil high-density polyethylene and may be either pre filled or field filled with a bituminous mastic coating or approved equal.

E11.4.16 Galvanic Anodes

(a) Galvanic anodes for cathodic protection of buried ferrous pipes and fittings shall be 10.9 kg pre-packaged zinc anodes to City of Winnipeg specification.

E11.4.17 Petrolatum Tape Corrosion Protection System

(a) Petrolatum tape corrosion protection system shall consist of the following components:

(i) Petrolatum paste primer

(ii) Void-filling mastic filler

(iii) Petrolatum tape

(iv) Protective outerwrap

(b) Petrolatum tape systems shall conform to AWWA C217.

(c) Approved products: Petrolatum tape system manufactured by Denso North America Inc., Trenton Corporation, Petro Coating Systems Ltd, or approved equal in accordance with B7.

(d) Submit Shop Drawings for petrolatum wrapping system in accordance with CW1110.

E11.4.18 Ventilation Pipe Hangers

(a) Replacement pipe hangers shall be constructed from RFP and provide no direct metal to metal contact with the aluminum ventilation piping.

(b) FRP hangers shall be constructed from UV stabilized FRP product meeting the requirements of ASTM D3917 and D4385.

(c) All hardware shall be stainless steel meeting the requirements of E11.4.1.

(d) Hangers shall be anchored to the tunnel roof with stainless steel wedge anchors.

(e) Hangers shall allow for adjustment to suit the existing pipe configuration and placement.

(f) Pipe hangers and wedge anchors shall have sufficient load capacity to support the 75 mm aluminum ventilation piping. The Contractor may reduce spacing of the existing pipe hangers to suite the load carrying capacity of the proposed hanger system. However, spacing of the new anchors may not be increased from existing.

E11.5 Methods

E11.5.1 All disassembled piping shall be inspected for defects after sandblasting. The Contract Administrator shall be notified of any defects affecting the long term performance of the piping, such as cracks and pitting which may require repair prior to coating works.

E11.5.2 Victaulic Components

(a) Confirmation of Victaulic Components

(i) The Contractor shall confirm the diameter and style of existing Victaulic couplings prior to procurement of materials.

(ii) The Contractor shall clean the existing couplings sufficiently to identify the coupling style and required replacement components.

(iii) A qualified representative of Victaulic shall be present at the investigation to confirm the coupling style.

(b) The Contractor shall have sufficient Victaulic coupling components on site prior to commencement of the work to reassemble the feeder main piping and replace corroded components as specified.

E11.5.3 Installation of Lead Wires, Continuity Bonding and Galvanic Anodes

(a) Anodes and continuity bonding shall be installed on new and existing pipes and fittings where shown on the Drawings or as directed by the Contract Administrator.

(b) Thermite Welding Procedure:

(i) Prepare steel surface to bare metal by grinding or filing. Remove all coatings, dirt, mill scale, oxide, grease, moisture, and other foreign matter from weld areas in an area required to complete the weld.

(ii) Before welding, remove wire insulation as required to fit mold, avoiding damage to the exposed copper wire. If wire is cut or nicked over halfway through its diameter, cut off and strip new end. If manufacturer requires the use of a copper sleeve, crimp it securely to wire and remove excess wire protruding from the end of the sleeve.

(iii) After charge is set, remove mold and slag from weld area with welder’s hammer. Strike top and sides of weld with hammer to test secureness of connection. If weld does not hold, remove scrap weld material, clean, and begin weld process again.

(iv) After welding and before coating the cleaned weld area, the Contract Administrator may test the joint bond for and wires for electrical continuity.

(v) When the weld passes test for soundness and electrical continuity, repair the coating in the weld area with mastic and weld cap placed over the weld. Clean weld area to remove any loose material, and welding residuals. Cover exposed

metal on the pipe and wire with mastic filled weld cap. Ensure weld cap covers the entire area of coating removed for installation of the thermite weld. If not, repair coating as per the coating manufactures recommendations prior to installing weld cap.

E11.5.4 Coatings

(a) Where indicated on the Drawings and directed by the Contract Administrator, prepare metal surfaces for recoating using the following methods:

(i) Steel - Prepare steel surfaces for recoating by blast cleaning to near-white metal as specified by Joint Surface Preparation Standard NACE No.2/SSPC-SP10.

(ii) Cast and Ductile Iron - Prepare ductile iron surface in accordance with NAPF 500-03.

(iii) Remove all dust and loose residues from the prepared surfaces and surrounding area. The surface shall be roughened to a degree suitable for the coating system employed.

(b) Protect valve seals, machined surfaces, threads, and nameplates from sandblasting.

(c) Primer coat to follow immediately after completion of sandblasting and prep.

(d) Apply liquid epoxies of prepared surfaces in accordance with AWWA C210, E11.4.12, and the manufactures recommendations.

(e) Apply fusion bonded epoxies of prepared surfaces in accordance with AWWA C213, E11.4.13, and the manufactures recommendations.

(f) Provide adequate ventilation and heat to facilitate curing of coatings.

(g) Interior linings for pipes and fittings shall be applied and cured as recommended by the manufacturer prior to placing into service. Linings must be fully cured for immersion service prior to installation and reinstating the line into service. Where accelerated cure times are required for assembly and water immersion, a coating and curing plan shall be submitted to the Contract Administrator in accordance with E4 a minimum of five (5) Business Days prior to application.

E11.5.5 Field Welding of Steel Pipelines and Fittings

(a) Field welding of steel pipes shall conform to AWWA C206.

(b) Connections to existing pipelines shall be accomplished with a full penetration butt weld or a fillet welded split sleeve (external).

(c) Patches on steel pipelines shall be of equal thickness of the host pipe and shall be filet welded.

(d) All fillet welds shall have minimum leg lengths equal to the thickness of the material being welded.

(e) All welds shall be inspected using magnetic particle testing methods by a qualified inspector in accordance with ASTM E1444.

E11.5.6 Installation of Petrolatum Tape Corrosion Protection Systems

(a) Install in accordance with AWWA C217 and the manufactures recommendations.

(b) For all surfaces to be wrapped with the corrosion protection system, remove loose rust, paint and foreign matter by hand and/or power tool cleaning in accordance with SSPC-SP-2 or SSPC-SP-3.

(c) Apply a thin uniform coat of petrolatum paste primer, using a glove or brush, to all surfaces to be wrapped with the corrosion protection system.

(d) Apply void-filling mastic filler, by hand, to all flanges designated to be wrapped with the corrosion protection system. Mold the mastic to a rounded configuration around the flange, filling all spaces around fasteners and eliminating sharp edges and irregular shapes.

(e) Spirally wrap the petrolatum tape, using a minimum 25mm overlap, over the primed and mastic-filled pipe and flange surfaces. While wrapping, press out all air pockets and smooth all lap seams.

(f) Spirally wrap clear outerwrap, using sufficient tension to make a tight-fitting cover, over the petrolatum tape.

E11.5.7 Bedding

(a) All pipes shall be installed in accordance with CW2030, utilizing a Class B bedding.

E11.5.8 Assembly of Flanged Piping Systems

(a) All flanges shall be assembled in accordance with AWWA M11 and AWWA C604.

E11.5.9 Rehabilitation of Existing Flange and Victaulic Feeder Main Joints

(a) All existing feeder main joints within the west tunnel and tunnel shaft shall be rehabilitated as part of the work.

(b) Flange joints shall have excessive corrosion product removed, bolts replaced as necessary, and be wrapped with a petrolatum corrosion protection system in accordance with E11.4.17 and E11.5.6.

(c) Victaulic joints shall have excess corrosion product removed, hardware replaced, and be wrapped with a petrolatum corrosion protection system in accordance with E11.4.17 and E11.5.6. Where existing Victaulic couplings are severely corroded and cannot be reused, they shall be replaced. Replacement of Victaulic gaskets on the CIPP rehabilitated feeder main is not required.

(d) The Contractor is advised of the potential for asbestos in the existing pipe coatings and shall have testing completed prior to completing the work. All work shall be completed in accordance with Workplace safety and Health requirements.

(e) If the Contractor elects to remove the existing feeder main piping from the tunnel as part of the rehabilitation works all joints shall be reassembled with new hardware, gaskets, and Victaulic couplings.

E11.5.10 Install Corrosion Protection Wrap on Existing Feeder Main

(a) One defect in the existing feeder main coating was identified during the tunnel inspection in 2019, see Appendix D. The Contractor shall wrap this location with a petroleum corrosion protection wrap in accordance with E11.4.17 and E11.5.6.

E11.5.11 Asbestos Abatement

(a) The Contractor is advised of the potential for asbestos in the existing pipe coatings within the west tunnel shaft and tunnel. The Contractor shall have asbestos testing completed prior to commencement of the work and have asbestos abatement completed as required to complete the work.

(b) All work shall be completed in accordance with Workplace Safety and Health regulations.

(c) Asbestos abatement shall be completed in accordance with E17 or E18.

E11.5.12 Replacement of Tunnel Ventilation Pipe Hangers

(a) The Contractor shall replace each existing ventilation pipe hanger in accordance with the manufacturer's recommendations.

(b) Ferrous metal components shall be di-electrically isolated from aluminum ventilation piping.

E11.6 Measurement and Payment

E11.6.1 Pipeline Access

(a) "Pipeline Access" shall be measured and paid on a Lump Sum basis as listed in Form B: Prices.

(b) Payment for “Pipeline Access” shall include the supply of all materials and equipment required to complete the Work, including excavation, shoring, disassembly and reassembly of piping, and backfilling as specified herein.

(c) Payment for Pipeline Access will be as follows:

(i) 50% payment of the Pipeline Access Modifications lump sum price upon completion of excavations and commencement of cleaning operations.

(ii) The remaining 50% payment of the Pipeline Access Modifications lump sum price upon turn over of the feeder main for return to service and the closure, sealing, and backfill of existing chambers.

E11.6.2 Sandblast and Recoat Existing Feeder Main Fittings

(a) Sandblasting and recoating existing feeder main components within the east tunnel shaft will be measured and paid for on a lump sum basis at the Contract Unit Price for “Sandblast and Recoat Interior and Exterior of 600 mm Feeder Main Drop Pipe & Fittings” as listed in Form B: Prices.

(b) Payment for “Sandblast and Recoat Interior and Exterior of 600 mm Feeder Main Drop Pipe & Fittings” will include payment for all labour and materials to complete the work as specified. Included components:

(i) Existing 600 mm cast iron side outlet 90 deg elbow (upper)

(ii) Existing 600 mm steel feeder main drop pipe

(iii) Existing 600 mm cast iron 90 deg elbow (lower)

E11.6.3 Rehabilitate Existing Victaulic Feeder Main Joints

(a) Rehabilitation of existing Victaulic feeder main joints will be measured and paid for on a unit basis for each Victaulic joint acceptable rehabilitated at the Contract Unit Price for “Rehabilitate 600 mm Victaulic Feeder Main Joints within the Tunnel and Install Corrosion Protection Wrap” as listed in Form B: Prices.

(b) Payment for “Rehabilitate 600 mm Victaulic Feeder Main Joints within the Tunnel and Install Corrosion Protection Wrap” will include payment for all labour and materials to complete the work as specified.

E11.6.4 Rehabilitate Existing Flanged Feeder Main Joints

(a) Rehabilitation of existing flanged feeder main joints will be measured and paid for on a unit basis for each flanged joint acceptable rehabilitated at the Contract Unit Price for “Rehabilitate 600 mm Flanged Feeder Main Joints within the Tunnel and Install Corrosion Protection Wrap” as listed in Form B: Prices.

(b) Payment for “Rehabilitate 600 mm Flanged Feeder Main Joints within the Tunnel and Install Corrosion Protection Wrap” will include payment for all labour and materials to complete the work as specified.

E11.6.5 Install Corrosion Protection Wrap on Existing Feeder Main (300 mm Wide)

(a) Installation of corrosion protection wrap on the existing feeder main will be measured and paid for on a unit basis for each 300 mm section of feeder main wrapped and accepted at the Contract Unit Price for “Install Corrosion Protection Wrap on the Existing Feeder Main within the Tunnel (300 mm wide)” as listed in Form B: Prices.

(b) Payment for “Install Corrosion Protection Wrap on the Existing Feeder Main within the Tunnel (300 mm wide)” will include payment for all labour and materials to complete the work as specified.

E11.6.6 Sandblast and Recoat Existing Steel Components within the West Tunnel Shaft

(a) Sandblasting and recoating existing feeder main components within the east tunnel shaft will be measured and paid for on a lump sum basis at the Contract Unit Price for “Sandblast and Recoat Interior and Exterior of 600 mm Feeder Main Drop Pipe & Fittings” as listed in Form B: Prices.

(b) Payment for “Sandblast and Recoat Interior and Exterior of 600 mm Feeder Main Drop Pipe & Fittings” will include payment for all labour and materials to complete the work as specified.

E11.6.7 Replace Existing Tunnel Ventilation Pipe Hangers

(a) Replacement of the existing tunnel ventilation pipe hangers will be paid for on a lump sum basis at the Contract Price for “Replace Existing Tunnel Ventilation Pipe Hangers” as listed in Form B: Prices.

(b) Payment for “Replace Existing Tunnel Ventilation Pipe Hangers” will include payment for all labour and materials to complete the work as specified.

E11.6.8 Asbestos Testing

(a) Testing for Asbestos in the existing feeder main coatings within the west tunnel shaft will be considered incidental to the “Pipeline Access” and will not be measured for payment. No separate payment will be made.

E11.6.9 Provisional Item – Replace Existing Victaulic Coupling

(a) Replacement of existing Victaulic feeder main joints where required will be measured and paid for on a unit basis for each Victaulic coupling supplied and installed at the Contract Unit Price for “Supply 600 mm Victaulic Feeder Main Coupling” as listed in Form B: Prices.

(b) Payment for “Supply 600 mm Victaulic Feeder Main Coupling” will include payment for all labour and materials to complete the work as specified.

E11.6.10 Provisional Item – Asbestos Abatement

(a) Asbestos Abatement (if required) will be measured and paid for on a lump sum basis at the Contract Price for “Asbestos Abatement in West Tunnel Shaft” as listed in Form B: Prices.

(b) Payment for “Asbestos Abatement in the West Tunnel Shaft” will include payment for all labour and materials to complete the work as specified.

E11.6.11 Provisional Item - Welded Steel Patches

(a) The supply and installation of welded steel pipeline patches shall be paid on a unit basis for each steel patch acceptably installed at the at the Contract Unit Price for “Welded Steel Patch on 600 mm Feeder Main Pipe (Max Dimension 300x300 mm)” as listed in Form B: Prices.

(b) Payment for “Welded Steel Patch on 600 mm Feeder Main Pipe (Max Dimension 300x300 mm)” shall include the supply of all materials and performance of preparation work, welding, and testing as specified herein.

E11.6.12 Optional - Removal of Feeder Main Piping from Within the Tunnel

(a) If the Contractor chooses remove the feeder main piping from within the tunnel to facilitate the CIPP lining, measurement and payment will be as follows:

(i) Payment for disassembly, removal, sand blasting, coating, reassembly with new hardware and gaskets, and any other materials and labour required to complete the work will be considered incidental to “Supply and Install 600 mm NSF 61 AWWA Class III Pressure CIPP Liner” and will be measured and paid in accordance with E14.9.2.

(ii) The replacement of Victaulic couplings will be measured and paid in accordance with E11.6.9.

E12. PIPELINE CLEANING

E12.1 Description

(a) This Specification shall cover the cleaning of the pipelines to be rehabilitated under this Contract.

E12.2 General

E12.2.1 Cleaning Objectives and Methods

(a) Proper cleaning of the host pipe is critical to ensure the liner obtains a tight fit with the host pipe and is installed in a manner consistent with long term design objectives.

(b) The quality of pipe cleaning and surface preparation is critical to the successful application of CIPP liners requiring bond for either structural integrity or for sealing against the host pipe to facilitate hydrostatic integrity of the relined system.

(c) The interior surfaces of the pipe to be lined shall be cleaned by methods to remove all sediment, corrosion products (rust and graphite), biology, chemicals or other deposits, loose and deteriorated remains of old coating materials, oil, grease, accumulations of water, debris and other foreign matter.

(i) The existing feeder main crossing was constructed with an interior coal tar epoxy lining.

(d) Service connections and end seals are locations where particular attention must be paid when cleaning and preparing pipe sections to facilitate achieving hydrostatic integrity of the relined system. Care must be taken to clean and prepare the full circumference of services and end seals to ensure the liner bonds to a dry, corrosion-free pipe surface. These precautions are needed to prevent recurrence of corrosion and resist the shear loads induced by any recurring and occasional surge pressures within the lined pipe. The cleaning method(s) chosen shall meet the performance requirements of this section. The selection of cleaning and preparation method(s) shall consider the potential for damage to service connections, appurtenances and the host pipe and take precautions to minimize potential damage before selection and deployment.

(e) The contractor should employ a combination of high-pressure flushing, pigging, mechanical cleaning, or other methods to ensure the host pipes are cleaned sufficiently to meet the stated design objectives.

(f) The existing feeder main has apparent leaks present along its length, determined through low leakage tests completed in 2019 which could be aggravated by aggressive cleaning methods, resulting in additional challenges for installation of the CIPP liners. Cleaning method shall be selected to suit the configuration and condition of the pipeline and minimise the potential to aggravate existing defects.

(g) The inspection report for the advanced electromagnetic inspection undertaken by PICA in 2019 can be found in Appendix C. The tunnel inspection report produced by AECOM can be found in Appendix D.

E12.3 Submittals

E12.3.1 Cleaning Plan

(a) The Contractor shall submit in writing a detailed cleaning plan for review by the Contract Administrator. The cleaning plan at a minimum shall include the following:

(i) Method(s) of cleaning.

(ii) Tools and equipment required

(iii) Sizes and densities of foam pigs to be used

(iv) Means of debris collection and disposal

(v) Shop drawings as identified herein

(b) Provide examples of the previous use of the proposed cleaning methods for water main CIPP rehabilitation projects. The Contract Administrator may require the submission of additional information, including pre and post inspection videos/photos to demonstrate the suitability of the proposed cleaning methods.

(c) The pipeline cleaning plan must be submitted a minimum of ten (10) Business Days prior to undertaking cleaning operations.

(d) No cleaning operations shall be undertaken prior to review of the cleaning plan by the Contract Administrator.

E12.3.2 Shop Drawings for Cleaning Pigs

(a) Where towed cleaning equipment is prosed, the Contractor shall submit Shop Drawings for the proposed winch line (or flusher hose), complete with the safe pull strength as recommended by the manufacturer.

(b) The Contractor shall submit Shop Drawings for all foam cleaning pigs and mechanical cleaning tools proposed for use.

E12.4 Products

E12.4.1 All pipeline cleaning products shall be equipment dedicated for use in potable water pipelines and shall not have any prior use in sewer or storm sewer applications.

E12.4.2 Foam Cleaning Pigs

(a) Material: One piece moulded open-cell polyurethane

(b) Density: up to a standard medium density cleaning pig (80 to 112 kg/m^3)

(c) Pigs shall be new and packaged for shipping.

(d) Pigs shall be supplied complete with a factory installed steel pulling cable. The cable and loops shall be rated for a tensile force equal to 1.5 times the capacity of the proposed winch. Pigs shall be supplied complete with a steel support disc on both ends suitable for towing pigs. The steel disk shall have a minimum diameter of 100 mm.

(e) Foam cores for pigs shall be of equal or greater density than foam body

(f) Pigs to be sized for the internal diameter of the pipeline or as recommended by the manufacturer for the intended purposes.

(g) Bristled pigs may use synthetic plastic or steel brushes.

E12.5 Equipment

E12.5.1 All pipeline cleaning equipment shall be equipment dedicated for use in potable water pipelines and shall not have any prior use in sewer or storm sewer applications.

E12.5.2 High velocity flushing equipment shall be specially designed for the purposes of cleaning water mains for rehabilitation.

E12.5.3 Winch and Winch Line

(a) Winch lines shall be one of the following:

(i) synthetic winch lines;

(ii) steel cable; or,

(iii) braided flusher hose.

(b) Proposed winch lines and hoses must have a third party verified tensile load rating. Minimum tensile strength for the wince line shall be 60 kN (13,490 lb) or as required to facilitate the cleaning operations, whichever is greater. Winch lines should have a minimum tensile capacity of 1.5 times the maximum or limited capacity of the winch as noted below.

(c) Winches used for cleaning purposes shall have sufficient load capacity to facilitate pipeline cleaning.

(d) Winches used for cleaning purposes shall be fitted with gauges capable of monitoring winching loads. Winch loads shall be monitored at all times to ensure the load rating of the winch lines and cleaning pigs is not exceeded. Controls on winch output must be implemented when winch lines do not meet the tensile capacities noted herein relating to winch capacity. Controls shall limit winch loads to 66% of the tensile capacity of the winch line.

E12.6 Methods

E12.6.1 All equipment being used within a potable water pipeline shall be spray or swab disinfected using a 200 mg/L free chlorine solution prior to entering or coming in contact with the pipe.

E12.6.2 The Contractor shall not deviate from the submitted and accepted cleaning plan without notification to and acceptance by the Contract Administrator.

E12.6.3 Pigging

(a) Where applicable, provide pig launch tubes, pipe and fittings, including valves.

(b) Winch lines shall be inserted into the pipelines for cleaning purposes. Winch lines may be inserted by high pressure flusher nozzle, flow drone or other accepted method.

(c) Foam cleaning pigs shall be tethered on each end and be capable of being winched in either direction.

(d) Pigging shall be completed in a progressive manner, commencing with undersized soft pigs before proceeding to more aggressing cleaning pigs.

E12.6.4 Mechanical Cleaning

(a) Mechanical cleaning (chain flails, scrapers) may be employed for the removal of hard debris. Setup and operation of mechanical cleaning methods shall be undertaken with an abundance of caution to not aggravate existing defects or otherwise damage the pipe prior to lining.

E12.6.5 Alternative Cleaning Methods

(a) Alternative cleaning methods other than those noted herein may be utilized upon review and acceptance by the Contract Administrator.

E12.6.6 Retrieval of Cleaning Equipment

(a) The Contractor shall be responsible for the retrieval of any cleaning equipment which becomes lodged within the host pipe and the repair of any damage to the host pipe caused by the work or the retrieval process.

E12.7 Measurement and Payment

E12.7.1 Pipeline Cleaning

(a) Pipeline Cleaning shall be measured and paid on a Lump Sum basis at the bid price for “600 mm Feeder Main Cleaning and Lining Preparation Work” as listed in Form B: Prices.

(b) Payment for “600 mm Feeder Main Cleaning and Lining Preparation Work” shall include the supply of all labour and materials required to complete the work as specified herein.

(c) Payment for “600 mm Feeder Main Cleaning and Lining Preparation Work” will be made upon acceptance of the cleaning works based on review of the pre-lining video by the Contract Administrator.

E13. PIPELINE INSPECTION

E13.1 Description:

(a) This Specification describes the requirements for obtaining water main measurements and inspections required to facilitate the specified rehabilitation work.

E13.2 Equipment

(a) Equipment shall meet the requirements CW 2145 and those identified herein.

(b) All CCTV inspection equipment shall be equipment dedicated for use in potable water pipelines and shall not have any prior use in sewer or storm sewer applications.

E13.3 Methods

E13.3.1 All equipment being used within a potable water pipeline shall be spray or swab disinfected using a 200 mg/L free chlorine solution prior to entering or coming in contact with the pipe.

E13.3.2 Verification of Existing Host Pipe Dimensions

(a) Verify dimensions and depths prior to installation as follows:

(i) Length of host pipe to confirm the liner length prior to installation.

(ii) Measure the diameter of the host pipe at a distance within the host pipe to get a measurement representative of the host pipe, minimum distance of 500 mm from the face. Use calibrated callipers or other suitable measuring device capable of measuring accurately to +/- 1 mm to confirm cross section geometry at the following clock positions:

- 12:00 to 6:00
- 2:00 to 8:00
- 3:00 to 9:00
- 4:00 to 10:00

(b) Confirm measurements and suitability of the manufactured liner with the Contract Administrator prior to lining.

E13.3.3 Perform the following pipeline inspections in accordance with CW 2145 and as outlined herein:

(a) For all CCTV inspections, the host pipe shall be fully dewatered to permit full inspection of the pipeline.

(b) Pre-Cleaning Inspection:

(i) Perform prior to undertaking pipe cleaning and preparation.

(ii) No coding of the CCTV submission will be required.

(c) Pre-Lining Inspection:

(i) Perform after host pipe cleaning and preparation.

(ii) If a CIPP pre-liner is installed two pre-lining inspections will be required, one prior to installation of the pre-liner and one prior to installation of the CIPP liner.

(iii) The Pre-Lining Inspection shall confirm:

- Necessary cleaning and pipe preparation work, including internal and external host pipe repairs, have been satisfactorily completed.
- Condition of the host pipe is consistent with the design conditions and the Specifications. The Contractor shall advise the Contract Administrator of any condition that is contrary to the design conditions or assumptions made that may affect either long or short term performance of the liner prior to commencing lining.

(iv) Pre-Lining CCTV/Sonar inspection shall be reviewed on site or provided to the Contract Administrator to review. Provide to the Contract Administrator a minimum of one (1) Business Day prior to lining for review and acceptance prior to proceeding with the liner installation.

(v) No coding of the submission will be required.

(d) Post-Lining Inspection:

(i) Perform immediately following installation of the liner, completion of service reinstatements, and liner terminations/end seals.

(ii) Intent is to confirm the adequacy of service reinstatements and the fit and finish of the liner.

(iii) Post-Lining inspection CCTV inspection report shall be submitted within one (1) Business Day of completion of the inspection to permit review prior to placing the water main into service.

(iv) Substantial Performance and Total Performance for the project will not be granted prior to submission and acceptance of the Post-Lining CCTV inspection and associated reports.

(v) Full coding required.

(e) Warranty Inspection:

(i) Warranty Inspection not required.

E13.3.4 Submit all inspection videos to the Contractor Administrator for review in accordance with CW 2145 and as specified herein.

E13.4 Inspection Reports

(a) Provide the Contract Administrator with the following inspection reports prepared in accordance with CW 2145.

(i) Pre and post-lining inspection and reports before acceptance of the Work for Total Performance.

E13.5 Amendments and Supplements to CW 2145:

E13.5.1 Replace Section 3.4 with:

(a) Ensure each operator is fully trained in all aspects of pipeline inspection and capable of making accurate observations and recording all conditions that may be encountered in the pipeline.

(b) Inspection shall be performed by certified operators in accordance with the National Association of Sewer Service Companies (NASSCO) having attained and retained their “Pipeline Assessment Certification Program” (PACP) and “Manhole Assessment Certification Program” (MACP) certification.

E13.5.2 Replace Section 3.5 with:

(a) Perform water main condition coding in accordance with the requirements of the NASSCO PACP and to version 7.0.0 of the manual or greater in general accordance with E13.5.1 and with the following additional requirements.

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
General Information	1	Surveyed By (*Operator / PACP User Name*)	Yes	Yes
	2	Certificate Number	Yes	Yes
	3	Reviewed By	No	No
	4	Reviewer Certificate Number	No	No
	5	Owner	No	Yes
	6	Customer	No	Yes
	7	P/O Number (*Contract No.*)	No	Yes
	8	Work Order	No	Yes
	9	Media Label	No	Yes
	10	Project	No	Yes
	11	Date	Yes	Yes
	12	Time	No	Yes
	13	Sheet Number	Yes	Yes
	14	Weather	No	Yes
	15	Pre-Cleaning	Yes	Yes
	16	Date Cleaned	No	No

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	17	Flow Control	No	No
	18	Purpose of Survey	No	Yes
	19	Direction of Survey	Yes	Yes
	20	Inspection Technology Used	No	Yes
	21	Inspection Status	Yes	Yes
	22	Consequence of Failure	No	No
	23	Pressure Value	No	No
Location	24	Drainage Area	No	Yes
	25	Pipe Segment Reference (*Asset ID*)	No	Yes
	26	Street (*Name and Number*)	Yes	Yes
	27	City	Yes	Yes
	28	Location Code	No	Yes
	29	Location Details	No	Yes
Pipe	30	Pipe Use	Yes	Yes
	31	Height (*Diameter*)	Yes	Yes
	32	Width	Yes	Yes
	33	Shape	Yes	Yes
	34	Material	Yes	Yes
	35	Lining Method	No	No
	36	Coating Method	No	No
	37	Pipe Joint Length	No	Yes
	38	Total Length (*Steel Tape Measurement*)	No	Yes
	39	Length Surveyed	No	Yes
	40	Year Constructed	No	No
	41	Year Renewed	No	No
Measurements	42	Upstream MH No.	Yes	Yes
	43	Upstream MH Rim to Invert	No	No
	44	Upstream MH Rim to Grade	No	Yes
	45	Upstream MH Grade to Invert	No	No
	46	Upstream MH Northing	No	No
	47	Upstream MH Easting	No	No
	48	Upstream MH Elevation	No	No
	49	Downstream MH No.	Yes	Yes
	50	Downstream MH Rim to Invert	No	Yes
	51	Downstream MH Rim to Grade	No	No
	52	Downstream MH Grade to Invert	No	No
	53	Downstream MH Northing	No	No
	54	Downstream MH Easting	No	No

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	55	Downstream MH Elevation	No	No
	56	MH Coordinate System	No	No
	57	MH Vertical Datum	No	No
	58	GPS Accuracy	No	No
	59	Additional Information	No	Yes*

Yes* - when required.

(b) Record place names in accordance with Clause 3.9.4 of the CW 2145.

E13.5.3 Further to Section 3.7.4, operators failing to provide copies of their NASSCO certification and / or meet the accuracy requirements on two occasions will not be permitted to code on the remainder of the Contract until they can demonstrate to the Contract Administrator that they can code in accordance with the requirements of the NASSCO PACP and MACP version 7.0.0 of the manual or greater.

E13.5.4 Further to Section 3.13, a paper or "hard copy" of the inspection reports are not required and the following digital format submissions shall be provided:

(a) The Contractor shall maintain backup copies of all digital video and inspection data submissions for the duration of the Warranty Period as stated in C13.

(b) CCTV inspections shall be submitted on a portable HDD or DVD, pipeline condition coding shall be submitted as a PACP.mdb and MACP.mdb files accordingly. Retained HDD's will be returned at the bi-weekly meeting.

(c) The Contractor shall supply separately two (2) duplicated, 2.5 inch portable HDD's, complete with all operating software, power adaptors and USB cables, containing all video inspections, post processed Multi-Sensor inspection data, inspection PACP and MACP defect coded reports and coding data to the City upon completion of the project.

(d) The Contractor shall supply separately one (1) set of archival grade digital versatile discs, DVD-R format in accordance with E13.5.6 to the City upon completion of the project.

(e) All HDD's shall be sized appropriately to accommodate all above mentioned files and have dual USB 3.0 (preferable) and (a minimum) USB 2.0 compatibility with a minimum data transfer rate of 480 MB/s.

E13.5.5 Replace Clause 3.8.1 with:

(a) Provide a minimum of 400 lines of resolution around the periphery of the picture for digital MPEG video playback.

E13.5.6 Replace Clause 3.11.1 with:

(a) Capture the inspections in digital format in colour from the live video source on archival grade digital versatile discs, DVD-R format to the following minimum requirements. Adjust requirements as required to achieve 400 lines of resolution specified in Clause E8.1.6 of this Specification.

(i) XDVD MPEG-2 or MPEG-4 format (MPEG-4 preferred).

(ii) Picture Size: NTSC 720 x 480 @ 29.97 frames per second.

(iii) Data/Bit Rate: 6.0 M-bits/sec.

(b) Replace Clause 3.17.7.6, with:

(i) Record the distance from the centre of the manhole to the cable calibration location at the start of the inspection and adjust the distance reading so that zero is at the centre of the start manhole. This distance is known as the cable calibration distance. The cable calibration location is the intersection point

between the camera's widest horizontal viewing angle and the pipe's side periphery (03 or 09 o'clock) when the camera is level and looking forward.

E13.6 Pipeline Inspection Equipment

E13.6.1 Notwithstanding CW 2145, CCTV equipment meet the following requirements:

(a) Minimum requirements of the in-line inspection platform include:

(i) Independently controlled drive tracks that enable the platform to manoeuvre around bends and climb over debris.

(ii) Operable under partially or fully submerged flow conditions, for distances up to 500m upstream or downstream from a single access point.

(iii) Operable in pipes constructed of standard pipe materials including concrete, PVC, HDPE, and steel.

(iv) Tethered to facilitate extraction of the platform from the pipeline, without causing damage to the existing infrastructure, in the event the equipment fails or otherwise becomes uncontrollable within the pipeline.

(v) Equipped with sufficient high intensity lighting to illuminate the pipeline for visual inspection.

(vi) Equipment shall be capable of continuously capturing digital video from first generation recordings with no frame loss, regardless of the progression of the inspection.

(vii) Equipment shall be used to acquire continuous digital video images of the pipeline for the entire length being inspected.

E13.6.2 Retrieval of Inspection Equipment

(a) Notwithstanding CW2145, the Contractor shall be responsible for the retrieval of any inspection equipment which becomes lodged within the host pipe and the repair of any damage to the host pipe caused by the work or the retrieval process.

E13.7 Measurement and Payment

E13.7.1 Verification of Host Pipe Dimensions:

(a) Verification of existing host pipe lengths, depths, and dimensions will be considered incidental to the Work and will not be measured for payment. No separate payment will be made.

E13.7.2 Pipeline Inspections:

(a) The total length of inspection to be paid will be the total length of water main inspected using CCTV to the satisfaction of the Contract Administrator for each identified inspection. Measurement will be made along the centerline of the host pipe as determined from the pre-cleaning and pre-lining CCTV inspections.

(b) Payment will not be made for inspections re-performed where the Contract Administrator has determined the requirements of the specification have not been satisfied.

(c) Siphon dewatering and other efforts to facilitate CCTV inspections will be considered incidental to "600 mm Pipeline Inspection" and will not be measured for payment. No additional payment will be made.

E13.7.3 Inspection Reports

(a) CCTV inspection reports will be considered incidental to the inspection and will not be measured for payment. No additional payment will be made.

E14. CURED IN PLACE PIPE (CIPP) LINERS FOR POTABLE WATER MAINS

E14.1 Description

E14.1.1 This specification covers the supply and installation of close-fit CIPP liners for the rehabilitation of potable water mains and other pressure pipelines.

E14.2 Definitions

(a) Close-fit liners are liners that fit integrally with the host pipe and when installed correctly are devoid of any annulus from a practical perspective that would facilitate the migration of water between the host pipe and the liner.

(b) Cured-in-place-pipe (CIPP) systems are resin-felt composite structures, with either fibers or membranes which when installed and cured will form a continuous-close fit liner within an existing water main.

(c) Acceptance Test – A test or a series of tests conducted under actual or simulated field conditions to determine whether a material system or component conforms to specified requirements in a construction or procurement document.

(d) Type Tests – Tests carried out under controlled laboratory conditions to demonstrate representative short or long term structural properties of a product or one of its components

(e) Demonstration Test – A Type or Acceptance Test carried out to demonstrate cause and effect by specified methods; used to establish the relationship between a specific set of procedures to prepare and apply a product and a desired outcome in terms of achieving target mechanical or other properties. For example, building a test panel to illustrate what combination of surface preparation and application technique/procedures are required to achieve target adhesion values.

(f) Material Resistance Adjustment Factor – Factors that define the expected end use condition in terms of the values obtained in Type Testing either due to the difference between controlled laboratory and actual or simulated field conditions or due to long term applied load effects where direct testing is not available

(g) Maximum Allowable Pressure (MAP) – The maximum combination of internal pressures that a pipe or lining system is anticipated to be exposed to including sustained, occasional surge and/or test pressure

(h) Maximum Allowable Operating Pressure (MAOP) – The maximum anticipated sustained internal operating pressure that a pipe system or liner is anticipated to be exposed to

(i) Occasional Surge (emergency or transient) Pressure – Short-term internal pressure events usually caused by emergency operations of the pipe network system (e.g. a rapid valve closure) or malfunction (e.g. power failure, component failure, etc.)

(j) Recurring (cyclic) Surge Pressure – Internal surge pressures that occur frequently and are inherent to the design and operation of the pipe network system (such as normal pump start-up or shutdown and normal valve opening or closure). Recurring surge pressure may occur millions of times in a piping system's lifetime.

(k) External Load –External loads due to earth pressure, static or fluctuating groundwater levels, or other non-dynamic loading sources

(l) Live Load – Dynamic loads due to vehicles, railways or airplanes

(m) Loads Due to Thermal Effects – Load induced shear effects due to thermal expansion and contraction of the pipe lining system or bonded liner materials

E14.3 Reference Standards

E14.3.1 The following reference standards may be applicable to this specification:

(a) AWWA Manual of Water Supply Practice M28 – Rehabilitation of Water Mains

(b) AWWA Report – Structural Classifications of Pressure Pipe Linings, Suggest Protocol for Product Classifications

(c) ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

(d) ASTM D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems

(e) ASTM F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

(f) ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

(g) ASTM D638 - Standard Test Methods for Tensile Properties of Plastics

(h) ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

(i) ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

(j) ASTM F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place thermosetting Resin Pipe (CIPP)

(k) ASTM D2290 - Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe

(l) ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

(m) ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

(n) ASTM D2992 - Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings

(o) ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

(p) NSF/ANSI Standard 61: Drinking Water System Components – Health Effects

(q) ACI 440.2R-08: Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures – Chapter 7 – Inspection, evaluation, and acceptance

E14.3.2 All reference standards shall be inferred to be the latest revision of the specific reference standard, unless a specific year is specified.

E14.4 Submittals Before Starting Work

E14.4.1 Provide the required submittals to the Contract Administrator a minimum of ten (10) Business Days before starting pre-work at each site or as noted below, whichever is sooner.

E14.4.2 Submit a liner design package a minimum of ten (10) Business Days prior to liner manufacturing, sealed and signed by a Professional Engineer licensed to practice in the Province of Manitoba experienced in the design of CIPP liners. Include the following information.

(a) Wall thickness computations including all specified design checks.

(b) For CIPP systems provide:

(i) Name and manufacturer of each unique resin and tube proposed for use.

(ii) CIPP curing schedule provided by the resin supplier indicating the temperature, staging, duration and pressure required to achieve a proper cure of the resin and fabric tube composite.

(iii) CIPP material properties used for design. The calculations shall clearly identify the short term and long term material properties assumed in the design and the long term creep retention factor utilized.

(iv) Substantiation of material properties used in design based on previous installations and quality control tests.

(v) Means of liner installation and curing method (e.g. air/steam, water, air/UV).

(c) Designer qualifications.

(d) Other information that may reasonably be required by the Contract Administrator to confirm the close fit liner design proposed conforms to the specified requirements and design intent.

E14.4.3 FTIR Testing Sample CIPP systems:

(a) Arrange for the manufacturer of the resin to provide a resin sample for Fourier transform infrared spectroscopy (FTIR) testing by the Contract Administrators QA testing lab such that blind testing can be carried out at the Owner's discretion and expense to confirm that the same resin is indeed being incorporated into the works.

E14.4.4 Submit a site planning and operations protocol that provides information on the following.

(a) An excavation, staging, and sampling plan that details:

(i) All required shaft locations, shaft sizes and shoring/excavation safety requirements.

(ii) Temporary water system layout.

(iii) Required storage and staging area.

(b) Sampling locations and Demonstration Test set ups to comply with Section E14.8.5 – Quality Assurance Requirements

(c) Traffic management to accommodate the full construction footprint at each site. See E10.

(d) Details of the host pipe preparation requirements. See cleaning protocol submission (E12.3.1) for cleaning requirements. Identify any additional preparation works required prior to lining.

(e) For CIPP systems, include a wet out plan, including:

(i) Resin impregnation method.

(ii) Designated location of the wet out facility if wet out not carried out on site.

(iii) Documentation the resin to be used has not exceeded its shelf life as recommended by the manufacturer of the resin including on-site pot life for multi-component epoxy resins.

(iv) Volume and weight of resin to be impregnated into each liner and repair section including any excess allowance for polymerization and migration.

(v) Methods used and required settings during the resin impregnation process to attain the required wall thickness

E14.4.5 Submit a liner termination plan providing the following information:

(a) Details of the termination seals to facilitate the transition from the installed liner to existing water mains and system appurtenances such as fittings and new valve and hydrant installations.

(b) Product description and applicable product literature.

(c) Identify any feeder main modifications required to utilize the proposed system. Where permanent feeder main modifications are required, the Contractor shall provide a liner termination drawing or drawings clearly showing the configuration of liner termination and connections to the existing feeder main piping. The drawing(s) shall illustrate the permanent piping configuration complete with all fittings, couplings, restraints, corrosion protection features, bedding and backfill requirements, and any other pertinent detail required for evaluation by the Contract Administrator and construction.

The drawing shall be sealed and signed by a Professional Engineer, registered in the Province of Manitoba and experienced in the design pressure pipelines.

(d) A detailed installation procedure.

(e) A minimum of three (3) examples of where the system has been used complete with liner design pressures and applicable pressure testing results.

E14.4.6 Submit a construction protocol that provides information on the following:

(a) Pre-lining material specifications, design calculations, and installation protocols if required. Pre-liner designs shall be sealed and signed by a Professional Engineer, registered in the Province of Manitoba and experienced in the design CIPP liners.

(b) Minimum and maximum pressures to install the liner during the installation and curing process.

(c) Provide the maximum allowable axial and longitudinal tensile stress for the liner and the arrangement for monitoring pull-in forces during installation if liner insertion is to be by pull-in methods.

(d) Number and location of heat source monitor gauges.

(e) Minimum and maximum allowable temperature during each phase of the cure period and controlling monitoring points.

(f) Number of stages and anticipated time for each stage of the curing period based on resin supplier's recommendations for CIPP systems.

(g) Estimated time line required to install and cure the liner, to reinstate the water services, to reinstate the water main, and carry out backfilling and final restoration.

E14.4.7 Submit a CIPP sampling protocol that provides the following:

(a) Detailed procedure for preparing plate samples, including a sample plate sample preparation quality control form. The Contractor shall provide a filled out plate sample preparation form for each plate sample provided, signed off by the wet out supervisor and project manager affirming the correct preparation of the samples. The form shall include the dimensions of the sample, direction of the circumferential fibres, and date of preparation, location of preparation.

(b) Sampling procedures for plate samples, confined pipe samples.

(c) Description of confined pipe forms to be utilised.

(d) Procedure, complete with diagram for placement of heat sink (sand bags) for confined pipe samples.

(e) Sizes for all samples to be obtained.

(f) Liner repair products and procedures for direct cut samples.

E14.5 Record Submittals

(a) Quality Control Records in accordance with E14.8.5.

(b) Manufacture recommended procedures for future service installation and maintenance.

(c) Manufacturer recommendation to installation of fitting and/or appurtenances within CIPP renewed section including termination methods and details.

E14.6 CIPP Material, Installer and Design Requirements

E14.6.1 Liner Rehabilitation Systems

(a) Liner rehabilitation systems shall be designated as a Class III Lining system as specified in AWWA Report – Structural Classifications of Pressure Pipe Linings, Suggest Protocol for Product Classifications and the supplemental requirements noted herein.

(b) Acceptable lining systems shall be qualified CIPP systems that meet the technical requirements identified herein. Spray-on lining systems will not be considered as acceptable lining systems for Class III liners in this specification.

(c) The following lining systems can be designed as Class III lining systems under many loading situations and host pipe defect patterns; and are approved for use subject to meeting project specific requirements and required installer experience as noted herein:

(i) Aqua-Pipe ® / Sanexen – CIPP based system
(ii) InsituMain TM / Insituform – CIPP based system
(iii) NordiPipe TM / Norditube Sekisui – CIPP based system
(iv) RS BlueLine TM / RS Technik – CIPP based system

Notwithstanding general approval for use of these products as Class III liners, the proposed lining system shall be required to meet all project specific requirements to be considered for use in the City of Winnipeg.

(d) Liner rehabilitation system shall be certified to NSF 61 Drinking Water System Components – Health Effects as Pipe liner- Immediate Return to Service for the pipe sizes and conditions specified herein.

E14.6.2 Close-Fit Liner Design Objectives

(a) Class III liners shall:
(i) Provide an internal corrosion barrier for the host pipe
(ii) Have the ability to span holes, gaps, and defects in the host pipe.
(iii) Have inherent ring stiffness such they do not collapse or appreciably change shape when dewatered or when exposed to transient vacuum conditions.
(iv) Maximize the structural enhancement of the composite liner-host pipe by providing a close-fit with the host pipe.
(v) Eliminate leakage in the host pipe by providing a liner with adequate hydrostatic integrity and a liner system design that prevents migration of water between the liner and the host pipe emanating from reinstated service connections.
(vi) Have a means of long term restraint in the axial direction to preclude differential movement between the host pipe and the liner.
(vii) Maximize hydraulic efficiency by providing a smooth flow channel and minimal reduction of bore in the rehabilitated system.

(b) Select a liner product and plan approach to rehabilitation toward maximizing the achievement of these design objectives.

E14.6.3 Close-Fit Liner Design – General

(a) The design shall be based on a Class III design requirements found in Appendix A of AWWA Report – Structural Classifications of Pressure Pipe Linings, Suggest Protocol for Product Classifications.

(b) A Class III liner shall be able to span defects in the host pipe at the MAOP and Occasional Surge Pressure as defined herein.

(c) A Class III lining design shall also consider additional design considerations where specified herein, including buckling under external hydrostatic pressure when dewatered and transient vacuum loads.

(d) The CIPP liner and liner termination systems shall be designed to support all imparted axial forces where rigid (fixed) liner terminations are utilized. Where liner terminations do not provide axial restraint they shall be designed to accommodate axial movement of the liner.

(e) Short term material properties may be utilized when completing design checks for transient pressure and vacuum conditions. All other design checks shall be completed using long term material properties.

E14.6.4 Close-Fit Liner Design – Project Specific Requirements

(a) The design shall conform to Appendix A of AWWA Report – Structural Classifications of Pressure Pipe Linings, Suggest Protocol for Product Classifications for Class III liners. The following minimum design assumptions shall apply:

(i) Material Properties:

- Designs shall utilize long term material properties for the proposed lining system determined through applicable short term material testing and derated through the application of applicable long term creep factors.
- Long-term value for flexural modulus of elasticity, flexural strength, and tensile strength will be considered to be the projected value at 50 years of a continuous application of the design load based on the specific resin and felt composite as established by ASTM D2990 or acceptable alternative testing methods.

(ii) Minimum factor of safety (N) of 2.

(iii) External Loads:

- Water mains crossing beneath rail lines: Where identified, applied soil pressures from a Cooper E80 rail load shall be estimated and utilized in the design of the CIPP liner. Rail loads shall include a track allowance dead load of 297 kg/m. Applied rail loads at depth shall be calculated using the Boussinesq solution for distribution of soil stresses from surface point loads. Impact factors for rail loads shall be calculated in accordance with the AREMA Manual for Railway Engineering.
- All other water mains: The applied soil pressures from an AASHTO HS 25 design truck unless a higher or lower value is indicated in the contract specifications shall be estimated and utilized in the design of the CIPP liner. Applied soil pressures from AASHTO design truck loads shall be estimated in accordance with AASHTO LRFD Bridge Design Specifications, Seventh Edition (2014).
- Unless otherwise specified, applied soil pressures at depth caused by superimposed surface loads shall be calculated using the Boussinesq solution for distribution of stresses from surface point loads.
- Calculate soil load based on soil density of 1920 kg/m3.
- Groundwater table is 2.0 m below the existing ground surface or the flood protection level of 230.76 m, whichever is greater.
- Modulus of soil reaction (E’s) will be assumed to be 6900 kPa unless a higher or lower value is indicated on the Construction Drawings.

(iv) Hydrostatic Pressure Loads:

- Maximum sustained operating pressure – 690 kPa (100 psi)
- Transient short term overpressure – 40% of maximum sustained operating pressure
- Vacuum pressure allowance – -50 kPa (-7 psi)
- Maximum allowable operating pressure (MAOP) for design – 1034 kPa (150 psi)
- Test pressure - – 862kPa (125 psi).
- Long term values for hoop stress shall be the time adjusted values projected at 50 years of continuous load.

- Design External Groundwater/River Level: 230.76 m (Flood Protection Level)

(v) Host Pipe Defects:

- Minimum value for ovality of the host pipe will be 2% unless a greater value is indicated on the Construction Drawings or as determined from observation of the CCTV inspection.
- 50 mm through wall corrosion defect shall be assumed for design purposes.

(vi) Liner Defects:

- The internal pressure rating shall be derated by a minimum 30% where circumferential finning is produced by installing the liner around bends. For example, a 1 MPa rated liner would be assessed for adequacy at 1 MPa – (30% of 1 MPa) = 0.7 MPa.

E14.7 Materials

E14.7.1 Liner Terminations

(a) Where specified the Contractor shall install end seals for the purposes of ensuring a hydrostatically integral connection between the CIPP liner and host pipe.

(b) Internal Mechanical Compression Seals

(i) Internal mechanical compression seals shall be constructed from EPDM rubber Derivative Membrane for use as joint liner material shall be manufactured in compliance with ASTM-D3900, D3568 and shall have designation M4AA710A13B13C12Z1Z2Z3 in accordance with ASTM-D2000.

(ii) Stainless steel bands, spacers, shims, and set screws for securing rubber membrane across piping joints shall be Type 303, 304, 316 or Maunell as manufactured in accordance with ASTM-A240.

(iii) Minimum pressure rating: 670 kPa (100 psi)

(iv) Internal mechanical compression seals shall be sized to accommodate potential axial movement (expansion and contraction) caused by both thermal and Poisson's effects in accordance with the AWWA Report – Structural Classifications of Pressure Pipe Linings, Suggest Protocol for Product Classifications.

(v) Accepted products: Quick Lock by Uhrig Kanaltechnik GmbH, Weko-Seal by Miller Pipeline Corp., L-Lock-P by Trelleborg Pipe Seals, or approved equal in accordance with B7.

(c) Sleeve Couplings with Fibreglass Pipe Stub

(i) The use of sleeve couplings in conjunction with the CIPP liner terminating within a fiberglass pressure pipe is acceptable where the CIPP liner can be demonstrated to provide a leak proof termination between the CIPP liner and the fibreglass pipe.

(ii) The fibreglass pressure pipe shall conform to AWWA C950 and have a minimum operating pressure rating of 670 kPa (100 psi). Internal diameter for the fiberglass pipe shall be sufficiently close to that of the host pipe to allow for a smooth transition

(iii) The Contractor shall provide historical field and demonstration testing data to demonstrate their ability to obtain a water tight seal between the CIPP liner and the fibreglass pipe through demonstration tests. Historical demonstration tests of the proposed system are acceptable.

(iv) Sleeve couplings shall conform to E11.

E14.8 Construction Methods

E14.8.1 Groundwater Intrusion

(a) The Contractor shall install a pre-liner or otherwise seal the host pipe from the intrusion of groundwater prior to lining. The pre-lining video shall clearly demonstrate that any water infiltration has been sealed prior to lining.

E14.8.2 Drying the pipe interior.

(a) A CIPP liner will not bond to a wet pipe surface. The constructor shall ensure that residual water and debris are removed from the pipe prior to lining. Options for the removal of excess water and remaining debris may include:

(i) Pulling tight fitting rubber disk squeegees through the pipe; but, they are not sufficient for drying the pipe. These shall be followed by oversized foam swabs must then be pulled through the cleaned and prepared main. The number of swab passes required depends on the condition of the main; swabbing must continue until the swabs emerge clean and dry.

(ii) Cleaned and prepared pipes may also be air-dried using a suitable, oil-free blower or vacuum system. The filters must be capable of removing 100% of the compressor oil from the air discharge and must be checked and cleaned regularly.

(b) The inability to remove all debris or water suggests inadequate cleaning, remaining leaks in the host pipe, or leaking valves. These faults should be investigated and remedied before the lining begins. It is important to note that the pipe must be inspected prior to lining to ensure it is free of visible moisture and free standing water along it length and in any pipe joints and recesses that are to be coated.

E14.8.3 Installation of Close Fit Liners

(a) Install CIPP liners by inversion methods in accordance with ASTM F1216 or by pull-in methods in accordance with ASTM F1743 or F2019 and the approved construction protocol submission for the site.

(b) CIPP liners shall be cured by hot water, steam or ultra-violet light. Carry out workmanship in accordance with ASTM D5813.

(c) Terminate ends of close fit liners in a manner that provides sufficient axial restraint to protect against differential axial movement between the host pipe and the liner and is sealed to be watertight as specified herein.

E14.8.4 Cleaning and Disinfection

(a) Cleaning and Flushing

(i) Water main cleaning shall meet the requirements of E11.6.10(a).

(ii) Clean and flush water mains in accordance with CW 2125.

(b) Disinfection

(i) Disinfect water mains in accordance to CW 2125 and E15.

E14.8.5 Quality Assurance Requirements

(a) The Contractor shall have in place a formal Quality Assurance Program. A program at least as rigorous as the Quality Assurance Requirements of Chapter 7 of ACI 440.2-R19 (Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures) is desired. As a minimum the Quality Assurance Program shall be designed to verify that design intent is achieved in the construction process.

(b) Maintain the following Quality Control records of the work and provide to the Contract Administrator after completion of the work (based on CIPP liners).

(i) Summary of the resin impregnation process including:

- Volume of resin supplied.

- Excess quantity of resin added during the wet out to account for polymerization and migration into the host pipe.
- Settings used to control wall thickness.
- Resin catalyst(s) used.
- Time and location of the wet out.
- Means taken to store and transport the resin impregnated CIPP from the wet out facility to the job site (for off-site wet outs).

(ii) Means of curing liners.

(iii) Continuous log of pressure maintained in the liner during the curing period.

(iv) Pulling force used to pull or winch CIPP into place in the host pipe and measured liner elongation.

(v) Continuous log of monitoring temperatures to confirm that the liner was cured as required.

E14.8.6 Acceptance Testing

(a) Carry out tests, secure samples and arrange for third party tests at the laboratory noted herein. The following Acceptance Testing is required:

(i) Carry out a pressure test on each liner installed as per Clause 8.3 of ASTM F1216. Minimum test pressure shall be 862kPa (125 psi). Equipment, recording and reporting requirements shall conform to CW 2125.

- Leakage allowance is an “apparent” leakage allowance to account for entrapped air, etc... Any visible or readily apparent leaks shall be repaired irrespective of leakage allowance.
- The pipe shall be pressurized at test pressure for 3 hours prior to test to allow for stabilization of the liner.
- Allowable apparent leakage shall be calculated as 0.077 litres per millimetre of pipe diameter per kilometer per hour

(ii) Confirm fit and finish meets the visual classification standards of ASTM D5813 and that the liner is free of excess wrinkling or other feature that reasonably may compromise its functional or structural performance design objectives.

(iii) Secure CIPP samples for testing in accordance with E14.8.7.

(iv) If adhesion is required to achieve the design objectives, secure confined samples and arrange for testing to confirm adequate adhesion to the host pipe has been achieved to meet functional and/or structural objectives. Adhesion testing shall be in accordance with ASTM D4451 and one location per site shall be mutually designated to use Demonstration Methods to confirm that surface preparation visual standards and standard installation protocol is sufficient to meet design objectives.

(b) If additional testing is required beyond the minimum testing noted above it shall be reviewed in the context as defective work testing or Owner requested additional testing. Owner requested additional testing shall be paid for by the Owner, while additional testing required as a direct result of deficient work shall be borne by the Contractor.

E14.8.7 CIPP Samples for Quality Assurance Purposes

(a) The following quality assurance testing will be completed on samples prepared during CIPP liner installation:

(i) short term flexural properties in accordance with ASTM D790;

(ii) short term flexural properties in accordance with ISO 11296;

(iii) wall thickness measurements in accordance with ASTM F1216 and D5813;

(b) The Contractor shall provide the following samples from each CIPP liner:

(i) One (1) confined test sample in accordance with E14.8.7(h). Confined test samples will be used for the following testing:

- Short term flexural properties (ISO 11296) or Apparent hoop tensile strength (ASTM D2290) depending on the governing failure mode.
- In place liner thickness measurements

(ii) Two (2) plate samples in accordance with E14.8.7(i). Plate samples are to be utilized for the following:

- Sample 1: Short term flexural properties (ASTM D790)
- Sample 2: Extra testing or tensile strength (ASTM D638) depending on the governing failure mode.

(c) The Contract Administrator will coordinate and pay for CIPP sample testing as noted herein.

(d) Flexural strength and flexural modulus results obtained from test plates will be reduced by the maximum percentage difference of the results of the confined pipe testing (ISO 11296) and test plate sample testing (ASTM D790) prepared from the same CIPP liner.

(e) The Contractor shall obtain and provide the Contract Administrator with pre and post lining measurements taken in accordance with E13.3.1 of this specification to confirm in-place liner thickness.

(f) The Contract Administrator will review CIPP liner thickness results taken from confined pipe samples.

(g) All samples shall be labeled as follows:

(i) “Kildonan-Redwood Feeder Main”

(ii) “Tender 347-2020”

(iii) Date of installation

(h) Confined Test Samples

(i) Provide necessary forms of the same diameter as the host pipe and secure a minimum 300 millimetre long full diameter confined test sample from each CIPP and internal point repair. Large diameter CIPP liners utilizing reinforcing may require a longer sample length, confirm with the Contract Administrator.

(ii) Confined pipe sample forms shall have an internal diameter equal to that of the steel feeder main.

(iii) Locate the test sample at a termination point and invert through the form.

(iv) Confined test sample forms shall be fully encapsulated with sand bags or a similar medium to form a heat sink and replicate the install conditions of the CIPP liner.

(v) Cut the CIPP sample to coincide with multi-piece form if used for CIPP larger than 450 millimetres in diameter to facilitate removal from the manhole. Provide the sample to the Contract Administrator complete with the form where used.

(i) Test Plate Samples

(i) Test plate samples shall be produced from a full thickness portion of the liner (where possible), shall contain the same resin and hardener ratios and volumes used in the CIPP liner wet-out. Ensure the test plate is clamped as close to the final installation thickness of the CIPP liner as possible.

(ii) For unreinforced liners the minimum dimension of test plate sample shall be 300mm x 300mm.

(iii) For reinforced liners the test plate sample shall be sized to accommodate a 32:1 span to depth (liner thickness) ratio. Circumferential reinforcing fibres shall be orientated in the long dimension of the test plate sample. Minimum dimensions for the test sample shall be as follows. Confirm the required test plate size for reinforced liners with the Contract Administrator prior to installation of the CIPP liner.

- Width: 13 times the thickness of the liner
- Length: 35.2 times the thickness of the liner

(iv) Prepare test plate samples on-site from the actual CIPP and cure in the following manner:

- in a clamped mold placed in the downtube or manhole for water-cured liners.
- In a clamped mold placed in a container filled with uniformly distributed steam from the installation manhole for steam-cured liners.

(v) Test plates shall be straight, true, and of sufficient thickness to prevent warping or curving during preparation and curing.

(vi) For reinforced liners, the direction of the circumferential reinforcement shall be clearly marked on the sample when prepared and wet-out. Markings that are damaged or obscured during the curing process shall be reapplied to ensure the testing laboratory can cut samples in the correct orientation.

E14.8.8 Infrared Spectroscopy (IR)

(a) Where the Owner desires IR testing, the Contract Administrator will arrange for testing at the Owner's expense to compare the infrared spectrum of the resin field samples supplied from the wet-out to the reference spectrum generated from the resin sample provided by the resin manufacturer to verify installed material acceptability.

E14.8.9 Post Construction Design Review for Total Performance

(a) The Contract Administrator will perform a post-construction design review to ensure that the completed close fit liner meets the 50 year design life structural requirements prior to Completion of Construction Acceptance. The design review will utilize the measured values for tensile strength, flexural strength, flexural modulus, and liner thickness from the sample testing.

(b) Close fit liner strength values will be further reduced to account for creep (tensile and/or flexural) based on the long term material property values used in design to confirm that the 50 year design life requirement has been met. The use of full enhancement factors in this analysis will be limited to liners that are confirmed by visual classification to be close-fit liners based on the post-lining pipeline inspection.

(c) The Contract Administrator will advise of any discrepancies between the constructed liner and the design requirements.

(d) Perform necessary remedial measures to confirm that a close fit liner deemed as structurally deficient will comply with the 50 year design life requirement such as additional testing to quantify the extent and nature of apparent defects and whether they compromise design intent.

(e) Repair sections of liner removed for supplemental testing in a manner approved by the Contract Administrator.

(f) Review remedial action with the Contract Administrator prior to implementation.

(g) Perform further testing, monitoring and calculations and install structural enhancements at own cost.

E14.9 Measurement and Payment

E14.9.1 Measurement and Payment will be made in accordance to CW2110, and as listed on Form B: Prices, except as amended below.

E14.9.2 CIPP Water Main Liner Installation

(a) CIPP Water main liners will be measured on a length basis for each diameter and paid for at the Contract Unit Price per metre for "Supply and Install 600 mm NSF 61 AWWA Class III Pressure CIPP Liner". Length to be paid for will be the total number of linear metres supplied and installed in accordance with this specification, accepted

and measured by the Contract Administrator measured between the following locations:

(i) The flange face on the lower 90 deg 600 mm bend within the existing west tunnel shaft as shown on the Drawings.

(ii) The plain end 600 mm pipe stub within the existing east valve chamber as shown on the Drawings.

(b) Payment for "Supply and Install 600 mm NSF 61 AWWA Class III Pressure CIPP Liner" will include all labour and materials required to complete the work as specified, including but not limited to:

(i) Provision of all required submissions.

(ii) Installation of CIPP pre-liners (if required).

(iii) Supply and installation of CIPP liners.

(iv) Provision of samples for testing.

(c) 80% payment will be made upon satisfactory completion of the liner and returning the water main to service. The remaining 20% of the payment will be made upon confirmation of the liner strength and delivery and acceptance of all required submissions, shop drawings, and reports.

E14.9.3 Liner Terminations

(a) The completion of liner terminations will be measured and paid on a lump sum basis at the Contract unit Price for "Supply and Install 600 mm Liner Terminations" as listed in Form B: Prices.

(b) Payment for "Supply and Install 600 mm Liner Terminations" will include all labour and materials necessary to complete the work as specified.

E15. WATER MAIN AND FEEDER MAIN DISINFECTION

E15.1 Description

E15.1.1 This specification covers the disinfection of water mains, feeder mains, and fittings.

E15.2 Disinfection

E15.2.1 Disinfection of water mains and feeder mains shall be completed in accordance with CW2125 and AWWA C651.

E15.2.2 The Contractor shall take every reasonable precaution during construction to prevent debris from entering the pipeline. If, in the opinion of the Contract Administrator, deleterious substances have entered the pipeline, the Contractor shall flush the pipeline with sanitized pipeline cleaning equipment.

E15.2.3 Upon completion of disinfection, chlorinated water shall be pumped from the pipeline at the lowest point(s) in the system. Chlorinated water shall not be directly discharged to the environment and shall be disposed of in accordance with E15.4.

E15.2.4 Bi-directional flushing may be required to remove chlorine from the pipeline.

E15.2.5 All equipment being used within a potable water pipeline shall be spray or swab disinfected using a 200 mg/L free chlorine solution prior to entering or coming in contact with the pipe.

E15.2.6 Blind flanges shall be supplied with ports adequate to achieve desired flushing velocities.

E15.2.7 The Contractor shall ensure hoses, hydrants, meters, and other appurtenances used for flushing operations are protected from freezing.

E15.2.8 The Contractor shall ensure that the selected means of disposing of chlorinated water does not result in unsafe site conditions as a result of freezing atmospheric temperatures.

E15.3 Health Testing

E15.3.1 The pipeline shall be refilled with potable water and water samples for health tests taken in accordance to CW 2125, except test samples shall be taken each day at least 24 hours apart for three (3) successive days.

E15.4 Disposal of Chlorinated Water

E15.4.1 Chlorinated water shall be treated by one of the following methods, as recommended in AWWARF – Guidance Manual For The Disposal Of Chlorinated Water:

(a) Discharged into nearby WWS MH's if possible. Allowable discharge rates for nearby WWS manholes have been provided on the Drawings. The Contractor may store water as required to meet allowable discharge rates.

(b) De-chlorination of water with discharge into the LDS system or directly to the river. If discharging directly to the river the Contractor shall take all necessary precautions to prevent erosion of the river bank. De-chlorination may be accomplished using the following:

(i) Sodium Ascorbate,

(ii) Vita-D-Chlor TM by Integra Chemical,

(iii) or approved equal in accordance with B7.

(c) Contain chlorinated water on Site until chlorine has dissipated to acceptable limits.

E15.4.2 The contractor shall submit a chlorinated water disposal plan in writing to the Contract Administrator a minimum of five (5) working days prior to performing any cleaning or flushing of water main or feeder mains. The disposal plan shall at a minimum include the following:

(a) Intended means of disposal for each site

(b) Means of de-chlorination (if required)

(c) Means of storing water for discharge (if required)

E15.5 Measurement and Payment

E15.5.1 Disinfection, Health Testing, and Disposal of Chlorinated Water

(a) Disinfection, health testing, and disposal of chlorinated water will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E16. CHAMBER MODIFICATIONS

E16.1 Description

(a) This Specification shall cover the modification and restoration of existing concrete valve chambers as shown on the Drawings.

E16.2 Shop Drawings

E16.2.1 Provide shop drawings in accordance with E2.

E16.3 Materials

E16.3.1 All materials shall conform to the requirements of this Specification and the requirements of the latest edition of the City of Winnipeg Standard Construction Specification.

E16.3.2 Structural Concrete

(a) Provide concrete mixed in accordance with requirements of CW 2160 and CAN/CSA-A23.2.

(b) Structural concrete design shall be in accordance with performance specification having the following properties:

(i) Class of Exposure: S-1

(ii) Minimum Compressive Strength @ 28 days: 35 MPa

E16.3.3 Reinforcing Steel

(a) Further to CW 2160 Sentence 2.6 Materials: Reinforcing Steel, all reinforcing steel shall conform to the requirements of CSA G30.18, Grade 400.

E16.3.4 Bar Accessories

(a) Bar accessories shall be of type approved by the Contract Administrator. They shall be made from a non-corroding material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete. Bar chairs are to be PVC; galvanized bar chairs are not acceptable.

(b) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices. Bar accessories are not shown on the Contract Drawings. The supply and installation of bar accessories shall be considered incidental to the supply and placing of reinforcing steel.

E16.3.5 Non Shrink Grout

(a) Grout, if required, shall be Sika Grout 212 or CPD Non Shrink Grout or approved equal in accordance with B7, mixed and applied in accordance with the manufacturer's instructions and of a consistency suitable for the intended application, as approved by the Contract Administrator.

E16.3.6 Concrete Patching Repair Material

(a) Patching repair material shall be polymer modified mortar based Sika Top 123 Plus by Sika Canada Inc., Master Emaco S 488CI by BASF Master Builders Solutions, or approved equal in accordance with B7.

E16.3.7 Foundation Waterproofing

(a) Foundation waterproofing shall conform to CW 2160.

E16.3.8 Removable Roof Slab Sealant

(a) Sealant for horizontal removable roof slab joints shall be a general purpose polyurethane sealant rated for buried and exterior locations and suitable for concrete.

E16.3.9 Joint Fillers

(a) Joint Fillers

(i) Joint filler for concrete slab shall be self-leveling, polyurethane sealant to meet requirements of ASTM C920, Type S, Grade P, Class 25, Use T, M, A, O, and I.

(ii) Approved product: Vulkem 45 as manufactured by Tremco, Sikaflex 1C SL, or approved equal in accordance with B7.

(b) Backer rod shall meet requirements of ASTM C1330.

(c) Bond Breaker: pressure sensitive plastic tape, which will not bond to sealants.

(d) Joint Cleaner: xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

E16.3.10 Extrudable Polyurethane Sealant

(a) Shall be non sag, polyurethane sealant

(b) Approved Products: Sikaflex 2C NSL or approved equal in accordance with B6.

E16.3.11 Extrudable Polyurethane Waterstop

(a) Extrudable polyurethane waterstop shall be a Gun Grade extrudable polyurethane base waterstop.

(b) Approved Products: SikaSwell S by Sika, or approved equal in accordance with B7.

E16.4 Construction Methods

E16.4.1 Construction Method Submission

(a) No Work shall commence on construction of valve chamber until after the Contract Administrator's review of the Contractor's Construction Method submission.

(b) The Contractor shall prepare for the Contract Administrator's review a Construction Method submission detailing:

(i) Construction sequence to be followed including all methods to be employed to ensure no damage occurs to existing structures or adjacent properties within or adjacent to excavation.

(ii) Proposed method of construction.

(iii) Specialized equipment to be used.

(iv) Any design revisions proposed to accommodate the Contractor's proposed construction method.

(v) Flow control considerations including details on the Contractor's proposed method of flow control.

(vi) The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of the Construction Method submission.

E16.4.2 Hatches and Removable Slabs

(a) Remove access hatches, covers and removable slabs where indicated on the drawings and as required for cleaning and inspection services. Replace all fasteners and bolts unless otherwise directed by the Contract Administrator.

(b) Replace all hatches and roof panels once cleaning and inspection work is complete.

(c) Installation of Roof Slab

(i) Remove all existing sealants and clean joint surfaces as per sealant manufacturer's instructions.

(ii) Apply sealant to horizontal surfaces in accordance with the sealant manufacturer's instructions.

(iii) Re-install roof slab.

(iv) Apply joint filler as shown on the Drawings and in accordance with the manufacturer's instructions.

(v) Fill all lifting hook recesses with polyurethane sealant.

E16.4.3 Cast-in-Place Concrete Construction

(a) Adjust the location of the reinforcing steel adjacent to openings and in location of the waterstop along the center line of wall to frame those openings in accordance with good practice and maintain the bar spacing intent.

(b) Do not use welded splices for reinforcing steel.

(c) Install foundation waterproofing in accordance with Specification CW 2160.

E16.4.4 Placing of Reinforcing Steel

(a) Reinforcing steel shall be placed accurately in the positions shown on the Contract Drawings. Carefully adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice and maintain the bar spacing intent.

(b) Splices in reinforcing steel shall be made only where indicated on the Contract Drawings. Prior approval of the Contract Administrator shall be obtained where, in the opinion of the Contractor, other splices must be made. All splices shall have laps of at least 40 bar diameters. Welded splices shall not be used.

(c) A minimum of twenty-four (24) hours notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of reinforcing steel.

E16.4.5 Concrete Patching

(a) Provide heating and hoarding to maintain the manufacturer's minimum installation and curing substrate temperature.

(b) Use materials in accordance with manufacturer's printed instructions, and as specified.

(c) Remove delaminated, loose, and spalled concrete using lightweight mechanical chipping hammers or other suitable means to sound concrete. Protect reinforcing bars during removal.

(d) Thoroughly clean all surfaces previously chipped of any loose concrete and/or laitance and prepare surface for patching in accordance with printed instructions from the manufacturer of the patching mortar. Use pressure washing to clean and prepare concrete surfaces. Do not damage the structures.

(e) Apply material to concrete substrate in accordance with the manufacturer's printed instructions.

(f) The patch repair and non-shrink grout shall be finished to match the profile of the surrounding concrete.

(g) Wet cure patch repairs and non-shrink grout in accordance with the manufacturer's printed instructions.

E16.5 Measurement and Payment

E16.5.1 Structural Concrete Repairs to Existing Roof Slab

(a) Structural concrete repairs to the existing west tunnel shaft roof slab will be measured and paid on a lump sum basis at the Contract Price for "Structural Concrete Repairs to Existing West Tunnel Roof Slab" as listed in Form B: Prices.

(b) Payment for "Structural Concrete Repairs to Existing West Tunnel Roof Slab" will include all labour and materials necessary to complete the work as specified.

E16.5.2 Miscellaneous Concrete Works

(a) Miscellaneous concrete works required to complete the Work, including but not limited to restoration of concrete thrust blocks will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E16.5.3 Bollards

(a) Construction of bollards will be measured and paid on a unit basis for each bollard acceptably installed at the Contract Unit Price for "Install Bollards at West Tunnel Shaft" as listed in Form B: Prices. Payment for "Install Bollards at West Tunnel Shaft" will include all labour and materials necessary to complete the work as specified.

E17. ASBESTOS ABATEMENT – TYPE 1

E17.1 General

(a) The site conditions identify the location and condition of all known asbestos-containing materials (ACM) to be disturbed by the work of this section. The specification fulfils the requirements of the report required by Manitoba Regulation 217/2006

(b) Existing pipe coatings within the west tunnel and tunnel shaft may contain asbestos.

(c) The Contractor may use Type 1 procedures for asbestos abatement on this project as long as all requirements of the Manitoba Regulation 217/2006 and these specifications are followed.

E17.2 Definitions

(a) Asbestos: Any of the fibrous silicates including: actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.

(b) Asbestos Abatement Consultant: The Contractor's hired consultant providing inspection and air monitoring.

(c) Asbestos Abatement Contractor: Contractor or sub-contractor performing work of this section.

(d) Asbestos-Containing Material(s) (ACM): Material(s) identified under Site Conditions including debris, fallen material and settled dust.

(e) Asbestos Work Area: Area where work takes place which will, or may, disturb ACM.

(f) Authorized Visitors: Prime Contractor, Building Owner or Representatives, Asbestos Abatement Consultant, and persons representing regulatory agencies.

(g) Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with Regulation 217/2006 and has knowledge of the potential or actual danger to health and safety in the work.

(h) Friable Material: means a material when dry can be crumbled, pulverized or powdered by hand pressure or is crumbled, pulverized or powdered.

(i) HEPA Filter: High Efficiency Particulate Arresting filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.

(j) Polyethylene: Either polyethylene sheeting or rip-proof polyethylene sheeting (as specified) with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from damage, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.

(k) Occupied Area: Any area of the building outside the Asbestos Work Area.

(l) Personnel: All contractors' employees, sub-contractors employees, supervisors.

(m) Remove: Remove means remove and dispose of (as applicable type of waste) unless followed by other instruction (e.g. remove and turn over to Owner).

E17.3 Submittals

E17.3.1 Submit prior to starting work:

(a) Copy of notification to governing authorities of commencement of work.

(b) Insurance certificates.

(c) Copy of Company Health and Safety Policy and applicable Programs.

(d) Pre-removal survey of damage in all areas where asbestos abatement will take place or waste will be transported.

E17.3.2 Submit the following information regarding personnel prior to starting work:

(a) Resumes of the supervisory personnel.

(b) Proof in the form of a certificate that supervisory personnel have attended a training course on asbestos removal (2 day minimum duration).

(c) WHMIS training certificates for all personnel.

(d) Written statement that personnel have had instruction on hazards of asbestos exposure, the use of respirator, protective clothing, worker and waste decontamination procedures, and all aspects of work procedures and protective measures.

(e) Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.

E17.3.3 Submit performance data on HEPA filtered vacuums including HEPA challenge integrity leak tests no more than three (3) months old prior to isolating the work area or commencing asbestos abatement.

E17.3.4 Submit the following prior to isolating the work area:

(a) Material Safety Data Sheets for chemicals or material used in the course of the Asbestos Abatement Project.

E17.3.5 Submit the following upon completion of the work.

(a) Manifests, waybills, bills of ladings, etc. as applicable for each type of waste.

E17.4 Regulations

E17.4.1 Comply with Federal, provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time work is performed.

E17.5 Supervision

E17.5.1 Provide on site, a supervisor, with authority to oversee all aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.

E17.5.2 The supervisor must be on site at all times during work at risk of disturbing ACM. Failure to comply with this requirement may result in a stoppage of work, at no cost to the Owner.

E17.5.3 Provide a minimum of one supervisor for every ten (10) workers.

E17.5.4 Replace supervisory personnel, with approved replacements, within three (3) working days of a written request from the Asbestos Abatement Consultant. Asbestos Abatement Consultant reserves the right to request replacement of supervisory personnel without explanation.

E17.5.5 Do not replace supervisory personnel without written approval from the Asbestos Abatement Consultant.

E17.5.6 The Asbestos Abatement Consultant

(a) The Asbestos Abatement Consultant hired by the Contractor shall be experienced in asbestos abatement removal and testing with a minimum of 5 years of experience.

E17.6 Quality Assurance

E17.6.1 Ensure the removal and handling of ACM or asbestos contaminated materials is performed by persons experienced in the methods, procedures and industry practices of asbestos abatement.

E17.6.2 Complete work so that at no time airborne asbestos, visible solid residue, or water runoff contaminates areas outside Asbestos Work Area. Asbestos Abatement Consultant is empowered to order a shutdown of work when a leak has occurred or is likely to occur. Cost of additional work by Asbestos Abatement Contractor and/or Asbestos Abatement Consultant to rectify unsatisfactory conditions shall be charged to the Asbestos Abatement Contractor.

E17.6.3 Perform all work involving other trades such as electrical, mechanical, carpentry, glazing, etc. using licensed persons experienced and qualified for the work required.

E17.7 Notification

(a) Notify Sanitary Landfill site as per local requirements.

(b) Inform all sub trades of the presence of ACM identified in the contract documents.

(c) Not later than five (5) days before commencing work on this project, notify in writing the local office of the Manitoba Labour and Immigration, Workplace Safety and Health Division. Provide telephone notification again immediately prior to start of work.

E17.8 Instruction and Training

E17.8.1 Provide instruction and training to all workers including the following:

(a) Hazards of asbestos.

(b) Use, care and disposal of protective equipment (including but not limited to respirators and filters) and clothing that would be used and worn during abatement work, including:

(i) Limitations of equipment.

(ii) Inspection and maintenance of equipment.

(iii) Proper fitting of equipment.

(iv) Disinfecting and cleaning of equipment.

(c) Personal hygiene to be observed when performing the work.

(d) The measures and procedures prescribed by this section.

E17.8.2 Instruction and training must be provided by a competent person.

E17.9 Personal Protection

E17.9.1 Provide non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters to personnel.

E17.9.2 Respirators shall be:

(a) Certified by the National Institute of Occupational Safety and Health (NIOSH).

(b) Fitted so that there is an effective seal between the respirator and the worker's face. Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.

(c) Assigned to a worker for their exclusive use.

(d) Maintained in accordance with manufacturer's specifications.

(e) Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.

(f) Repaired or have damaged or deteriorated parts replaced.

(g) Stored in a clean and sanitary location.

(h) Provided with new filters as necessary, according to manufacturer's instructions.

E17.9.3 Personnel must have respirators fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person.

(a) Personnel shall wear and use the respirator provided.

E17.9.4 Provide protective clothing which:

(a) Is made of a material that does not readily retain nor permit penetration of asbestos fibres.

(b) Consists of head covering and full body covering that fits snugly at the ankles, wrists and neck.

(c) Is replaced or repaired if torn or ripped.

E17.9.5 Decontaminate clothing or protective clothing by using a HEPA Vacuum, or by damp wiping prior to leaving the Asbestos Work Area:

(a) Dispose of as ACM.

E17.9.6 Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Asbestos Work Area.

E17.9.7 Prohibit smoking, eating, drinking, chewing in the Asbestos Work Area.

E17.9.8 Use hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

E17.10 Authorized Visitor Protection

(a) Provide clean protective clothing to Authorized Visitors.

(b) Ensure Authorized Visitors have received required training prior to granting entry into Asbestos Work Area.

E17.11 Products and Materials

E17.11.1 Materials and Equipment

(a) All materials and equipment brought to work site must be in good condition and free of asbestos, asbestos debris, and fibrous materials.

(b) Airless Sprayer: AC powered pressure washer that allows wetting agent to mix with water, uses no air or compressed air, and has a nozzle to regulate power and pressure.

(c) Amended Water: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.

(d) Asbestos Waste Container: An impermeable container acceptable to disposal site and Manitoba Sustainable Development. Labelled as required, comprised of one of the following:

(e) A 6 mil (0.15 mm) labelled yellow sealed polyethylene bag, inside a second clear 6 mil (0.15 mm) sealed polyethylene bag.

(f) A 6 mil (0.15 mm) sealed polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.

(g) HEPA Vacuum: High Efficiency Particulate Arresting (HEPA) filtered vacuum equipment with a filter system capable of collecting and retaining spherical particles greater than 0.3 microns at 99.97% efficiency.

(h) Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified in sheet size to minimize joints. New materials only.

(i) Post Removal Sealant (or Lockdown): Sealant that when applied to surfaces serves the function of trapping residual asbestos fibres or other dust. Product must have flame spread and smoke development ratings both less than 50. Product shall leave no stain when dry. Post Removal Sealant shall be compatible with replacement insulation or fireproofing where required and capable of withstanding service temperature of substrate. Apply to manufacturer’s instructions.

(j) Protective Clothing: Disposable full body coveralls complete with hoods manufactured of a material which does not permit penetration of asbestos fibres. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Dupont Tyvek or Kimberly Clark Kleenguard.

(k) Rip-Proof Polyethylene Sheeting: Minimum requirements 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and 2 layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps. New materials only.

(l) Tape: Duct tape or tape suitable for sealing polyethylene to surfaces under both dry and wet conditions in the presence of Amended Water.

(m) Wetting Agent: Non-sudzing surfactant added to water to reduce surface tension and increase wetting ability.

E17.11.2 Signage

(a) Work Area Signs: Post signs in both official languages at access points to the Asbestos Work Area and on hoarding walls as follows:

(i) CAUTION.
(ii) Asbestos Dust Hazard Area.
(iii) Unauthorized Entry Prohibited.
(iv) Wear Assigned Protective Equipment.
(v) Breathing Asbestos Dust May Cause Serious Bodily Harm.

(b) Asbestos Waste Containers: Post signs on both sides of every asbestos waste container. Signs must display thereon in large, easily legible letters that contrast in colour with the background the word “CAUTION” in letters not less than ten centimetres in height and the words:
(i) CONTAINS ASBESTOS FIBRES.
(ii) Avoid Creating Dust and Spillage.
(iii) Asbestos May be Harmful To Your Health.
(iv) Wear Approved Protective Equipment.

(c) Place placards in accordance with Transportation of Dangerous Goods Act.

E17.12 Execution

E17.12.1 Site Preparation

(a) Perform pre-removal damage survey and submit to Asbestos Abatement Consultant.

(b) Remove stored or non-fixed items from the Asbestos Work Area including but not limited to equipment, furniture, waste, etc. Store in area provided by Owner.

(c) Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.

(d) Remove visible dust and friable material from all surfaces in the work area including those to be worked on, using HEPA vacuums or wet wiping.

(e) Isolate Work area by shutting doors or installation of caution tape barricades.

(f) Install signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.

(g) Shut down HVAC systems serving the Asbestos Work Area.

(h) Install polyethylene sheeting over openings in ducts and diffusers and seal.

(i) HVAC to remaining areas of building must not be disrupted during work of this section.

(j) System shall remain inoperative until completion of work, unless ducts can be effectively capped.

(k) Perform work at scheduled times after shutting down HVAC systems affecting the Asbestos Work Area.

E17.12.2 Maintenance of Asbestos Work Area

(a) Maintain Asbestos Work Area in tidy condition.

E17.12.3 Asbestos Removal - General

(a) Do not use powered tools or non-hand held tools.

(b) Do not use compressed air to clean or remove dust or debris.

(c) Do not break, cut, drill, abrade, grind, sand or vibrate ACM if it cannot be wetted.

(d) Frequently and at regular intervals during the work, clean up dust and waste using HEPA vacuums and/or wet sweeping or mopping.

(e) Frequently and at regular intervals, place all waste in asbestos waste containers.

(f) Immediately upon completion of work, clean area with HEPA vacuum and/or wet sweeping or mopping.

E17.12.4 Waste and Material Handling

(a) Waste bins must be placed on grade or in receiving.

(b) All bins must be locked and covered when waste transfer is not being performed.

(c) Ensure redundant non-ACM, rubble, debris, etc. removed during contaminated work are treated, packaged, transported and disposed of as asbestos waste.

(d) Clean and wash equipment prior to removal from Asbestos Work Area if removed prior to completion.

(e) Place all equipment, tools and unused materials that cannot be cleaned in Asbestos Waste Containers.

(f) As work progresses, and at regular intervals, transport the sealed and labelled asbestos waste containers from the Asbestos Work Area to waste bin.

(g) Place items in bins according to waste classification. Place asbestos waste, metals, non-asbestos waste, etc. in separate bins.

(h) Removal of waste containers and decontaminated tools and materials from the Asbestos Work Area shall be performed as follows:

(i) Remove any visible contamination from the surface of the non-porous or sealable item being removed from the Asbestos Work Area. If the item can be cleaned, remove it from the site. If it cannot be cleaned thoroughly, place it in an Asbestos Waste Container.

(ii) Place waste or item in Asbestos Waste Container and seal closed.

(iii) Wet wipe outside of Asbestos Waste Container.

(iv) At entrance to Asbestos Work Area, place in second Asbestos Waste Container. Seal closed.

(v) Remove the item from the Asbestos Work Area.

(i) Transport waste and materials via the predetermined routes and exits. Arrange waste transfer route with Owner. Use a closed, covered cart to transport through Occupied Areas.

(j) Provide workers transporting waste with means to access full personal protective equipment and all tools required to properly clean up spilled ACM in the case of a rupture of an Asbestos Waste Container.

(k) Pick-up and drop off of garbage bin shall be at pre-approved times, and must not interfere with the Owners operations.

(l) Transport asbestos contaminated waste to licensed landfill.

(m) Co operate with Manitoba Sustainable Development inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to the Owner.

E17.12.5 Application of Post Removal Sealant

(a) Apply one coat of Post Removal Sealant with an airless sprayer, in accordance with Manufacturer's Instructions, to cover all surfaces on all items in the Asbestos Work Area, including but not limited to polyethylene, ACM substrate, structural steel, and surfaces scheduled for demolition.

(b) Do not apply post removal sealant to materials that will be damaged by it.

E17.12.6 Asbestos Work Area Dismantling

(a) Wash or HEPA vacuum equipment used in Asbestos Work Area, seal vacuum hoses and fittings.

(b) Place tools and equipment used in contaminated work site but not cleaned in 6 mil polyethylene bags prior to removal from Asbestos Work Area.

(c) Clean polyethylene sheeting with HEPA vacuum or wet cleaning methods at completion of work.

(d) Remove seals, tape, signage, etc.

(e) Seal openings in HEPA vacuums.

(f) Place polyethylene sheeting, seals, tape, clothing and other contaminated waste in asbestos waste containers, wet wipe and place in second asbestos waste container.

(g) Rigid barriers that are to be reused shall be cleaned thoroughly.

E17.12.7 Re-Establishment of Items

(a) Upon completion of work:

(i) Move items that were removed from Asbestos Work Area prior to work, back into same location within Asbestos Work Area.

(ii) Clean, mop and vacuum Asbestos Work Area.

(iii) Enable building air handling systems.

E17.13 Measurement and Payment

(a) Asbestos Abatement will be measured and paid in accordance with E11.6.10.

E18. ASBESTOS ABATEMENT – TYPE 3

E18.1 General

E18.1.1 The site conditions identify the location and condition of all known asbestos-containing materials (ACM) to be disturbed by the work of this section. The specification fulfils the requirements of the report required by Manitoba Regulation 217/2006

E18.1.2 Existing pipe coatings within the west tunnel and tunnel shaft may contain asbestos.

E18.1.3 The Contractor may use Type 3 procedures for asbestos abatement on this project.

E18.2 Definitions

(a) Asbestos: Any of the fibrous silicates including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.

(b) Abatement Consultant: The Contractor’s hired consultant providing inspection and air monitoring.

(c) Abatement Contractor: Contractor or sub-contractor performing work of this section.

(d) Asbestos-Containing Material(s) (ACM): Material(s) identified under Site Conditions including debris, fallen material and settled dust.

(e) Work Area: Area where work takes place which will, or may, disturb ACM and/or MCM.

(f) Authorized Visitors: Prime Contractor, Building Owner or Representatives, Abatement Consultant, and persons representing regulatory agencies.

(g) Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with Regulation 217/2006, and has knowledge of the potential or actual danger to health and safety in the work.

(h) DOP Testing (or HEPA Integrity Test): Testing performed on HEPA Filtered Negative Pressure Machines and HEPA vacuums using DOP or equivalent. Testing shall ensure that total penetration from the unit does not exceed 0.03%, or 99.97% efficient of airborne particulate removal. DOP Testing must be in compliance with ASME N510-1989 (1995) and must be performed using a Temporary Mixing Chamber with installed baffles to allow uniform mixing of challenge aerosol.

(i) Friable Material: means a material when dry can be crumbled, pulverized or powdered by hand pressure or is crumbled, pulverized or powdered.

(j) HEPA Filter: High Efficiency Particulate Arresting filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.

(k) PCM: Phase Contrast Microscopy.

(l) Polyethylene: Either polyethylene sheeting or rip-proof polyethylene sheeting (as specified) with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from damage, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.

(m) Personnel: All contractors' employees, sub-contractors employees, supervisors.

(n) Occupied Area: Any area of the building outside the Work Area.

(o) Remove: Remove means remove and dispose of (as applicable type of waste) unless followed by other instruction (e.g. remove and turn over to Owner).

E18.3 Submittals

E18.3.1 Submit prior to starting work:

(a) Schedule.

(b) Copy of notification to governing authorities of commencement of work.

(c) Insurance certificates.

(d) Copy of Company Health and Safety Policy and applicable Programs.

(e) Pre-removal survey of damage in all areas where abatement will take place or waste will be transported.

E18.3.2 Submit the following information regarding personnel prior to starting work:

(a) Resumes of the supervisory personnel.

(b) Proof in the form of a certificate that supervisory personnel have attended a training course on asbestos removal (2 day minimum duration).

(c) WHMIS training certificates for all personnel.

(d) Certificate proving that each worker or supervisor on site has been fit tested for the respirator appropriate for the work being performed.

E18.3.3 Submit the following information regarding HEPA filtered devices prior to construction of enclosure or abatement:

(a) Performance data on HEPA filtered vacuums including DOP tests no more than 3 months old.

(b) Performance data on negative air units including DOP tests which must be no more than 3 months old if the unit is vented outdoors or which must be performed on site immediately prior to initial usage and when HEPA filters are changed or the unit is vented indoors.

(c) DOP tests to be performed by an independent testing company.

(i) DOP testing company is required to submit a detailed technical report of testing protocol, including Introduction, Methodology, Results, Conclusions, and Recommendations, including results of the Air-Aerosol Mixing Uniformity test as per ASME N510-1989 (1995).

(ii) DOP testing company must also provide calibration certificates from an independent calibration firm or from the manufacturer of the testing equipment for both the aerosol photometer and the pressure gauge on the aerosol generator dated within 1 calendar year from the on-site testing date.

(iii) DOP testing company must also provide the National Sanitation Foundation (NSF) certification name and number of the on-site technician performing the testing.

E18.3.4 Submit the following prior to isolating the work area:

(a) Written statement that the Ground Fault Interrupter Panels have been inspected by an electrician.

(b) Material Safety Data Sheets for chemicals or material used in the course of the Abatement Project.

E18.3.5 Submit the following upon completion of the work.

(a) Manifests, waybills, bills of ladings, etc. as applicable for each type of waste.

E18.4 Regulations

(a) Comply with Federal, provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time work is performed.

E18.5 Supervision

E18.5.1 Provide on site, a supervisor, with authority to oversee all aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.

E18.5.2 The supervisor must be on site at all times during work at risk of disturbing ACM and/or MCM. Failure to comply with this requirement may result in a stoppage of work, at no cost to the Owner.

E18.5.3 Provide a minimum of one supervisor for every ten (10) workers.

E18.5.4 Replace supervisory personnel, with approved replacements, within three (3) working days of a written request from the Abatement Consultant. Abatement Consultant reserves the right to request replacement of supervisory personnel without explanation.

E18.5.5 Do not replace supervisory personnel without written approval from the Abatement Consultant.

E18.5.6 The Asbestos Abatement Consultant

(a) The Asbestos Abatement Consultant hired by the Contractor shall be experienced in asbestos abatement removal and testing with a minimum of 5 years of experience.

E18.6 Quality Assurance

(a) Ensure the removal and handling of ACM and/or MCM or asbestos contaminated materials is performed by persons experienced in the methods, procedures and industry practices of asbestos abatement.

(b) Complete work so that at no time airborne asbestos, visible solid residue, or water runoff contaminates areas outside Work Area. Abatement Consultant is empowered to order a shutdown of work when a leak has occurred or is likely to occur. Cost of additional work by Abatement Contractor and/or Abatement Consultant to rectify unsatisfactory conditions shall be charged to the Abatement Contractor.

(c) Perform all work involving other trades such as electrical, mechanical, carpentry, glazing, etc. using licensed persons experienced and qualified for the work required.

E18.7 Notification

(a) Not later than five (5) days before commencing work on this project, notify in writing the local office of the Manitoba Labour and Immigration, Workplace Safety and Health Division. Provide telephone notification again immediately prior to start of work.

(b) Notify Sanitary Landfill site as per local requirements.

(c) Inform all sub trades of the presence of ACM and MCM identified in the contract documents.

E18.8 Personal Protection

E18.8.1 Protect all personnel at all times when possibility of disturbance of ACM and/or MCM exists.

E18.8.2 Provide the following respiratory protection to all personnel:

(a) Full Face Powered Air Purifying Respirators with P100 high efficiency (HEPA) cartridge filters during projects when performing wet abatement of non-surfacing asbestos-containing material specified in this section.

(b) Non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters for dismantling of Type 3 enclosures, using Type 2 Procedures.

E18.8.3 Respirators shall be:

(a) Certified by the National Institute of Occupational Safety and Health (NIOSH).

(b) Fitted so that there is an effective seal between the respirator and the worker's face. Ensure that no person required to enter the Work Area has facial hair which affects the seal between respirator and face.

(c) Assigned to a worker for their exclusive use.

(d) Maintained in accordance with manufacturer's specifications.

(e) Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.

(f) Repaired or have damaged or deteriorated parts replaced.

(g) Stored in a clean and sanitary location.

(h) Provided with new filters as necessary, according to manufacturer's instructions.

(i) Replace cartridge filters for negative pressure respirator every 16 hours of wear unless tested on site.

(ii) Replace PAPR cartridge filters every eight (8) hours of wear unless tested on site.

(iii) Mark filters for rotation and regular replacement.

(i) Worn by personnel who have been fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person.

E18.8.4 Provide protective clothing, to all personnel which:

(a) Is made of a material that does not readily retain nor permit penetration of asbestos fibres.

(b) Consists of head covering and full body covering that fits snugly at the ankles, wrists and neck.

(c) Is replaced or repaired if torn or ripped.

(d) Is disposed of as ACM.

E18.8.5 Wear hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

E18.8.6 Provide site specific instruction to workers before allowing entry to the Work Area. Instruction shall include training on entry and exit from the Work Areas. Instruction must be provided by a competent person.

E18.8.7 Provide soap, shampoo and towels for use by all personnel when leaving the Work Area.

E18.8.8 Prohibit smoking, eating, drinking, chewing in the Work Area and Decontamination Facilities.

E18.9 Work Area Entry Procedures

(a) Use the following procedure to enter contaminated Work Area:

(b) Remove street clothes in Clean Change Room.

(c) Put on respirator with new or tested filters, and protective clothing in Clean Change Room or clean side of Shower Room.

(d) Store all street clothes, uncontaminated footwear, towels, etc. in the Clean Change Room.

E18.10 Work Area Exit Procedures

E18.10.1 Use the following procedure to exit contaminated Work Area:

(a) Remove gross contamination from protective clothing using HEPA vacuum or by wet wiping.

(b) Proceed to Equipment and Access Room and remove all contaminated clothing and equipment except respirator.

(c) Store contaminated footwear, hard hats, etc. in Equipment and Access Room.

(d) Proceed naked to shower while still wearing respirator.

(e) Shower, cleaning outside of respirator with soap and water. Thoroughly wet body, head and hair, remove respirator and wash body, head and hair. Wet clean inside of respirator face piece.

(f) Remove filters for testing or dispose of in container provided for this purpose. Remove after leaving the Shower but prior to entering the Clean Change Room.

(g) Proceed to the Clean Change Room, dry off and dress in street clothing.

(h) Maintain and disinfect respirator.

E18.11 Authorized Visitor Protection

E18.11.1 Provide clean protective clothing to Authorized Visitors.

E18.11.2 Ensure Authorized Visitors have received required training and their own fitted respirator prior to granting entry into the Work Area.

E18.12 Air Monitoring

E18.12.1 Air monitoring will be performed following the National Institute for Occupational Safety and Health method 7400, Asbestos and other fibres by PCM (Phase Contrast Microscopy).

E18.12.2 Co-operate with the Abatement Consultant in collection of air samples. Abatement Contractor to exercise care with Abatement Consultant's equipment. The Owner reserves the right to back-charge the Abatement Contractor for further collection of samples damaged by tampering or abuse. In addition, the Abatement Contractor will be responsible for the cost of testing equipment repairs resulting from the actions of the Abatement Contractor's forces.

E18.12.3 PCM samples will be collected from within the Work Area, after the site has passed a visual inspection and an acceptable coat of post removal sealant has been applied. These airborne fibre levels must not exceed 0.01 fibre/mL (Air Monitoring Clearance Inspection). If these results show fibre levels in excess of 0.01 fibre/mL:

(a) Maintain Work Area isolation.

(b) Re-clean entire Work Area.

(c) Apply another acceptable coat of post removal sealant to exposed surfaces throughout the Work area.

(d) Repeat above measures until visually inspected and air monitoring results are at a level equal to that specified.

E18.12.4 The results of all post-remediation air clearances and any final occupancy testing, shall be compared against consensus guidelines established by governing authorities. Should these results prove unacceptable, the Contractor shall re-clean the work area until acceptable results are obtained.

E18.12.5 Cost of additional inspection and sampling performed as a result of elevated fibre levels may be charged to the Abatement Contractor at the Owner’s discretion.

E18.13 Inspection

E18.13.1 From commencement of work until completion of clean-up operations, the Abatement Consultant will be present periodically on site both inside and outside the Work Area.

E18.13.2 The following Milestone Inspections will take place, at the Owner's cost:

(a) Milestone Inspection A - Visual Clearance

(i) Inspection of Work Area after removal of all asbestos, but prior to application of lock-down agent.

(b) Milestone Inspection B - Air Monitoring Clearance

(i) Inspection and air monitoring after the application of lock-down agent, but prior to removal of Polyethylene from within the Work Area.

E18.13.3 Do not proceed with next phase of Work until written approval of each milestone is received from the Abatement Consultant.

E18.13.4 In addition to the Milestone Inspections, inspection of the Work Area may be performed to confirm the Abatement Contractor's compliance with the requirements of the contract documents and governing authorities. Any deviations from these requirements that have not been approved in writing may result in a stoppage of work, at no additional cost to the Owner.

E18.13.5 The Abatement Consultant is empowered by the Owner to inspect for final cleanliness at completion. Additional labour or materials expended by the Abatement Contractor to provide satisfactory performance to the level specified shall be at no additional cost.

E18.13.6 Inspection and air monitoring performed as a result of Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule may be charged to the Abatement Contractor at the Owner’s discretion.

E18.14 Differential Pressure Monitoring

E18.14.1 Install differential pressure monitor.

E18.14.2 Replace damaged or non-functional equipment at the request of the Abatement Consultant.

E18.14.3 Maintain specified differential pressure at monitoring location. Negative air pressure is to be -0.02 inches of water, relative to the area outside the enclosed area.

E18.14.4 Record data at start and end of shift and maintain records on file.

E18.14.5 Stop contaminated work and take corrective action if pressure differential drops below the specified level. Notify Abatement Consultant immediately.

E18.15 Products and Facilities

E18.15.1 Materials and Equipment

(a) All materials and equipment brought to work site must be in good condition and free of asbestos, asbestos debris, and fibrous materials.

(b) Airless Sprayer: AC powered pressure washer that allows wetting agent to mix with water, uses no air or compressed air, and has a nozzle to regulate power and pressure.

(c) Amended Water: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.

(d) Asbestos Waste Container: An impermeable container acceptable to disposal site and Manitoba Sustainable Development. Labelled, comprised of one of the following:

(i) A 6 mil (0.15 mm) labelled yellow sealed polyethylene bag, inside a clear 6 mil (0.15 mm) sealed polyethylene bag.

(ii) A 6 mil (0.15 mm) sealed polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.

(e) Differential Pressure Monitor: a high precision instrument for measuring and controlling pressure differences in the low range, between the Work Area and occupied area. Acceptable Product: Magnehelic gauge (Cat. No. 2000-00) manufactured by Dwyer Instruments Inc. or equivalent. Calibrate regularly to manufacturer's instructions.

(f) Discharge Ducting: Polyethylene Tubing. Reinforced with wire. Diameter equal to negative pressure machine discharge. Not to be longer than required, or so long that negative pressure is compromised.

(g) Ground Fault Panel: Electrical panel as follows:

(i) Ground fault circuit interrupters of sufficient capacity to power temporary electrical equipment and lights in the Work Area.

(ii) Interrupters to have a 5 mA ground fault protection.

(iii) Necessary accessories including main switch disconnect, ground fault interrupter lights, test switch to ensure unit is working, and reset switch.

(iv) Openings sealed to prevent moisture or dust penetration.

(v) Inspected by electrician.

(h) HEPA Filtered Negative Pressure Machine: Portable air handling system which extracts air directly from the Work Area and discharges the air to the exterior of the building. Equipped as follows:

(i) Prefilter and HEPA filter. Air must pass HEPA filter before discharge.

(ii) Pressure differential gauge to monitor filter loading.

(iii) Auto shut off and warning system for HEPA filter failure.

(iv) Separate hold down clamps to retain HEPA filter in place during change of prefilter.

(i) HEPA Vacuum: High Efficiency Particulate Arresting (HEPA) filtered vacuum equipment with a filter system capable of collecting and retaining spherical particles greater than 0.3 microns at 99.97% efficiency.

(j) Hose: Leak-proof, minimum busting strength of 200 PSI or greater if required, abrasion resistant covering, reinforcing, and machined-brass couplings. Maintained and tested. Hose to be temperature resistant if it is to carry domestic hot water.

(k) OSB: Oriented Strand Board.

(l) Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified in sheet size to minimize joints. New materials only.

(m) Post Removal Sealant (or Lockdown): Sealant that when applied to surfaces serves the function of trapping residual asbestos fibres or other dust. Product must have flame spread and smoke development ratings both less than 50. Product shall leave no stain when dry. Post Removal Sealant shall be compatible with replacement insulation or fireproofing where required and capable of withstanding service temperature of substrate. Apply to manufacturer's instructions.

(n) Protective Clothing: Disposable full body coveralls complete with hoods manufactured of a material which does not permit penetration of asbestos fibres. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Dupont Tyvek or Kimberly Clark Kleenguard.

(o) Rip-Proof Polyethylene Sheeting: Minimum requirements 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and 2 layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps. New materials only.

(p) Shower Hose: Water lines for supply of hot & cold water to shower facilities to be rated for use at 200 PSI (1380 kPa) or twice the working pressure whichever is greater. Supply lines to be continuous and free of fittings, joints or couplings.

(q) Sprayer: Garden type portable manual sprayer or water hose with spray attachment if suitable.

(r) Tape: Duct tape or tape suitable for sealing polyethylene to surfaces under both dry and wet conditions in the presence of Amended Water.

(s) Wetting Agent: Non-sudzing surfactant added to water to reduce surface tension and increase wetting ability.

E18.15.2 Hoarding Walls

(a) Hoarding Wall: 38 mm x 89 mm wood or metal studs at 400 mm o/c with continuous sill and top plate, covered with one layer of rip-proof polyethylene sheeting on each side of wall.

E18.15.3 Decontamination Facilities

(a) Workers' Decontamination Facility: A decontamination facility comprised of three linked rooms, Contaminated Change Room, a Shower Room, and a Clean Change Room.

(b) Rooms, Occupied Areas and Work Areas, shall be separated by curtained doorways at each door.

E18.15.4 Contaminated Change Room: Room between Shower Room and Work Area.

(a) Locate on contaminated side of Shower Room.

(b) Install asbestos waste container for asbestos contaminated protective clothing.

(c) Install storage facilities for any personal protective equipment to be reused in Work Area including boots, hard hats, etc., but excluding respirators.

(d) Install hooks and shelves as required for personal protective equipment.

(e) Minimum size of generally 2 m x 2 m. Increase size accordingly to accommodate number of workers.

E18.15.5 Shower Room: Room between Clean Change Room and Contaminated Change Room.

(a) Install one walk through shower unit for every six workers.

(b) Install constant supply of hot and cold water, controllable at each shower. Water supply must be sufficient to provide water at a minimum temperature of 40 degrees Celsius (maximum 50 degrees) in a volume required for all workers to properly decontaminate.

(i) Install individual hot and cold shut-off valves on water supply located on clean side of Shower Room. Connect shower to these valves.

(ii) Install individual controls inside the shower to regulate water flow and temperature.

(c) Install rigid piping or Shower Hose with watertight connections for supply and drains.

(d) Install a sealed drip pan under and around the showers, 150 mm deep.

(e) Install sump pumps, sufficient for volume of waste shower water from showers and drip pan. Direct waste shower water to sanitary drains.

(f) Install ground fault protected power switch on clean side of shower for sump pumps, or timed for shut off.

(g) Provide adequate quantity of soap, shampoo, clean towels

(h) Install an Asbestos Waste Container for disposal of used respirator filters, on the contaminated side of the Shower Room.

E18.15.6 Clean Change Room: A room between the Shower Room and Occupied Areas.

(a) Install hooks and shelves on clean side of shower in clean Change Room for storage of respirators.

(b) Install lockers or hangers for workers' street clothes and personal belongings.

(c) Install hose bib on domestic cold water pipe for connection on clean side of Work Area.

(d) Install electric hot water heater/tank for showers in decontamination facility.

(e) Provide ground fault protected power supply to hot water tanks, sump pump, battery chargers.

(f) Install a fire extinguisher, mount to wall.

(g) Minimum size of generally 2 m x 2 m. Increase size accordingly to accommodate number of workers.

E18.15.7 Waste and Equipment Decontamination Facility: Waste and Equipment Decontamination Facility comprised of three linked rooms: a Container Cleaning Room, a Holding Room and a Transfer Room.

(a) Purpose of Waste and Equipment Decontamination Facility is to provide a means to decontaminate asbestos waste containers, scaffolding, vacuums, and other tools and equipment and materials required in the Work Area.

(b) Rooms, Occupied Areas and Work Areas, shall be separated by curtained doorways at each door.

E18.15.8 Container Cleaning Room: Room between Work Area and Holding Room of sufficient size to allow proper washing of equipment and waste containers or double bagging of waste. All wash water shall be treated as asbestos contaminated waste.

E18.15.9 Holding Room: Room between Container Cleaning Room and Transfer Room, of sufficient size to accommodate at least two asbestos waste containers and two workers double bagging waste, or for largest item of equipment used.

E18.15.10 Transfer Room: Room between Holding Room and Occupied Area, acting as an air lock for the transfer of waste.

E18.15.11 Construction of Decontamination Facilities

(a) Install floor protection as follows:

(i) Install one layer of rip-proof polyethylene sheeting over two layers of 6 mil polyethylene sheeting beneath entire decontamination facility.

(ii) Turn 600 mm of polyethylene up the sides of the decontamination facility and overlap with the polyethylene sheeting covering the walls.

(b) Install walls as follows:

(i) Around all rooms, between all rooms, at entrance to the Work Area and at entrance to Occupied Area.

(ii) Install 38 x 89 mm wood framing at 610 mm o/c with continuous top and sill plates.

(iii) Install one layer rip-proof polyethylene sheeting on walls of Decontamination Facility.

(c) Install roof as follows:

(i) Install joists. Size of joists is to be determined by clear span. For clear spans up to 2850 mm use SPF Select 38 x 140 mm wood joist at 400 mm o/c with continuous 38 x 140 mm wood headers, and install strapping beneath joists.

(ii) At the Contaminated Change Room and where roof is exposed to the Work Area, install 19 mm plywood or OSB over joists. Caulk and tape joints and install one layer rip-proof polyethylene sheeting over 2 layers of 6 mil polyethylene sheeting.

(iii) Where roof is not exposed to the Work Area, install one layer rip-proof polyethylene sheeting over joists.

(iv) Turn 600 mm of polyethylene down the sides over polyethylene on the perimeter walls.

(v) Minimum interior clear height 2 m to underside of joist.

E18.15.12 Curtained Doorways

(a) Construct as follows:

(i) Install two flap doors, full width and height of door opening at all doors between chambers, facilities and Work Area.

(ii) Construct each flap door of two layers of polyethylene sheeting with all edges reinforced with tape. Use wood strapping to securely fasten flap doors to head and alternate jambs.

(iii) Install weights attached to bottom edge of each door flap.

(iv) Provide direction arrows on flaps to indicate opening.

E18.15.13 Signage

(a) Work Area Signs: Post signs in both official languages at access points to the Work Area and on hoarding walls as follows:

(i) CAUTION.

(ii) Asbestos Hazard Area.

(iii) Unauthorized Entry Prohibited.

(iv) Wear Assigned Protective Equipment.

(v) Breathing Asbestos Dust May Cause Serious Bodily Harm.

(b) Asbestos Waste Containers: Post signs on both sides of every asbestos waste container. Signs must display thereon in large, easily legible letters that contrast in colour with the background the word “CAUTION” in letters not less than ten centimetres in height and the words:

(i) CONTAINS ASBESTOS FIBRES.

(ii) Avoid Creating Dust and Spillage.

(iii) Asbestos May be Harmful to Your Health.

(iv) Wear Approved Protective Equipment.

(c) Place placards in accordance with Transportation of Dangerous Goods Act.

E18.16 Execution

E18.16.1 Clean Site Preparation

(a) Perform pre-removal damage survey and submit to Abatement Consultant.

(b) Remove stored or non-fixed items from the Work Area, including but not limited to equipment, furniture, waste, etc. Store in area provided by Owner.

(c) Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.

(d) Maintain emergency and fire exits from Work Area, or establish alternative exits satisfactory to Provincial Fire Marshall and local authorities having jurisdiction. Maintain extra routes from occupied areas. Place emergency exit signs at locations to clearly mark exit route. Seal emergency exit doors so as not to impede use of door during emergency evacuation.

(e) Remove items specified to be reused or turned over to Owner.

(f) Install Hoarding Walls between Work Area and Occupied Area.

(g) Install Worker Decontamination facility.

(h) Install Waste Decontamination facility.

(i) Install signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.

(j) Seal openings in ceilings using polyethylene, tape, caulking, etc.

(k) Establish negative pressure in the Work Areas as follows:

(i) Install HEPA Filtered Negative Pressure Machines sufficient to maintain pressure differential of -0.02 inches of water between contaminated Work Area and Occupied Areas.

(ii) Arrange HEPA Filtered Negative Pressure Machines to maximize differential pressure in the Work Area.

(iii) Install weighted flaps in perimeter Hoarding Walls as necessary to provide make-up air.

(iv) Operate HEPA Filtered Negative Pressure Machines continuously from first disturbance of ACM until completion of dismantling.

(v) Replace prefilters frequently to maintain specified flow rate.

(vi) Replace HEPA filters as required to maintain flow rate and integrity of unit.

(vii) Discharge HEPA filtered negative pressure machines as follows:

- To building exterior.
- Install and make airtight all negative air discharge ducting.
- Discharge ducting is not to be longer than required, and to be straight, so that the length of the ducting does not reduce the flow from negative pressure machines.

(l) Provide a Ground Fault Panel in the Work Area.

(i) Ensure safe installation by licensed electricians.

(ii) Connect to building power at electrical panel outside Work Area.

(iii) Cable to be completely jacketed with no defects. Tag/mark cable as Live.

(iv) All electrical equipment used during work shall be supplied power from a Ground Fault Panel.

(m) Install temporary lighting in all work areas at levels that will provide for a safe and efficient use of the work area.

(n) Isolate, at panel, and disconnect existing power supply to the Work Area. Power supply to remaining areas of building must not be disrupted during work of this section.

(i) Lock-out/tag-out power at electrical panels.

(ii) Mark/tag any items within or passing through the Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc.

(o) Install hose bib on domestic cold water pipe for connection of hoses for wetting.

(i) Install hoses with watertight connections and airless sprayers to wet asbestos-containing materials.

(p) Shut down HVAC systems serving the Work Area.

(q) Seal openings in dormant rigid ductwork with rip-proof poly. Cap openings in live ducts with equal gauge metal and duct sealant.

(r) Clean and protect electrical systems in the Work Area with polyethylene and tape. Include all communication, coaxial, triaxial, fire and public address systems, wiring, conduit, speakers, heat and smoke detectors, alarms, exit lights, junction boxes, etc.

(s) For HVAC systems to remain active within the Work Area, perform the following:

(i) Remove insulation from exterior of duct.

(ii) Clean outside and seal duct or equipment with one layer of rip-proof polyethylene sheeting over one layer of 6 mil polyethylene sheeting so as to make air tight.

(iii) Seal HVAC systems while deactivated.

(iv) Seal seams of cap and duct with duct sealant, tape and polyethylene sheeting. Smoke test seal after system is reactivated. Reseal and retest as required.

(v) Smoke test seals regularly and maintain.

E18.16.2 Maintenance of Contaminated Work Area

(a) Inspect Work Area at the beginning and end of each working period and once on each day work does not take place. Inspection must be performed by competent person.

(b) Inspect HEPA filtered negative pressure machines including discharge ducting at the beginning and end of each working period. Inspection must be performed by competent person.

(c) Perform Differential Pressure Monitoring on a frequent basis and record pressure at start and end of shift at a minimum.

(d) Inspect polyethylene sheeting and ensure it is effectively sealed and taped. Repair damage and remedy defects immediately.

(e) Inspect electrical panels and ensure locks and tags are on panels prior to entering the Work Area.

(f) Maintain Work Area in tidy condition.

(g) Remove waste and debris frequently.

(h) Remove standing water on polyethylene/floor at the end of every shift.

(i) Turn off water supply to hoses and reduce pressure in hose, prior to leaving the Work Area at end of shift.

(j) Turn off water supply to showers, at the end of every shift.

(k) Ensure shower pans are pumped out at the end of every use and shift.

E18.16.3 Wet Removal

(a) Do not use compressed air to clean or remove dust or debris.

(b) Spray asbestos-containing materials and contaminated materials with Amended Water using airless spray equipment.

(c) Remove the drywall ceilings. Place drywall directly into 6 mil polyethylene waste bag, or sealed container.

(d) All dislodged ACM and/or MCM shall be maintained in wet state until placed in asbestos waste containers for disposal.

(e) As work progresses, and at regular intervals, place waste in asbestos waste containers and remove from the Work Area.

(f) Remove and dispose of debris from the ground.

(g) Wet clean or HEPA vacuum the entire Work Area excluding the ground, including surfaces not covered with polyethylene sheeting. Any materials or equipment removed to access ACM that are to be reused, must be wet cleaned or vacuumed prior to reinstatement.

(h) Notify Abatement Consultant at least twenty-four (24) hours prior to the need for Milestone Inspection A (Visual Clearance). Obtain written approval for this Milestone Inspection before proceeding.

E18.16.4 Waste and Material Handling

(a) Waste bins must be placed on grade or in receiving.

(b) All bins must be covered and locked when waste transfer is not being performed.

(c) Ensure redundant non-ACM, rubble, debris, etc. which was not cleaned and which was removed during contaminated work are treated, packaged, transported and disposed of as asbestos waste.

(d) Clean, wash and apply Post Removal Sealant to non-porous materials prior to disposal as clean waste.

(i) Obtain prior written approval from the Abatement Consultant for each individual type of material.

(e) Clean and wash equipment prior to removal from Work Area if removed prior to completion.

(f) Place all equipment, tools and unused materials that cannot be cleaned in Asbestos Waste Containers.

(g) As work progresses, and at regular intervals, transport the sealed and labelled asbestos waste containers from the Work Area to waste bin.

(h) Place items in bins according to waste classification. Place asbestos waste, metals, non-asbestos waste, etc. in separate bins.

(i) Removal of waste containers and decontaminated equipment and materials from the Work Area shall be performed using the Waste and Equipment Decontamination Facility as follows:

(i) Prior to entering the Waste and Equipment Decontamination Facility Container Cleaning Room, the first worker (fully protected inside the Work Area) shall remove any visible contamination from the surface of the item or waste container being removed from the Work Area.

(ii) The first worker then carries the item into the Container Cleaning Room and wet sponges the item prior to passing the item through the curtained doorway to a second worker in the Holding Room. (The second worker shall be fully protected with respirator and disposable clothing and may only leave the decontamination facility via the Work Area.)

(iii) The second worker in the Holding Room double bags or wraps and seals the item. Without entering the Transfer Room, the second worker passes the item through the curtained doorway into the Transfer Room.

(iv) A third worker enters the Transfer Room from the clean area. (The third worker must never enter the Holding Room.) The third worker removes the item from the Transfer Room and transports it to the disposal bin.

(j) Dispose of asbestos-contaminated waste that could tear a 6 mil (0.15 mm) polyethylene bag in sealed rigid Asbestos Waste Container.

(k) Transport waste and materials via the predetermined routes and exits. Arrange waste transfer route with Owner. Use a closed, covered cart to transport through Occupied Areas.

(l) Limit transportation of waste and materials through Occupied Areas of the building to Quiet Hours.

(m) Provide workers transporting waste with means to access full personal protective equipment and all tools required to properly clean up spilled ACM in the case of a rupture of an Asbestos Waste Container.

(n) Bin loading area and waste routes shall be kept clean at all times. Use Type 2 asbestos abatement procedures if appropriate or requested by Owner's Representative.

(o) Pick-up and drop off of garbage bin shall be at pre-approved times, and must not interfere with the Owners operations.

(p) Transport asbestos contaminated waste to licensed landfill.

(q) Co operate with Manitoba Sustainable Development inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to the Owner.

E18.16.5 Work Area Dismantling

(a) Use Type 2 worker precautions during dismantling.

(b) Operate negative air units during dismantling.

(c) Polyethylene, tape, cleaning material, etc. to be treated as asbestos waste.

(d) Wash remaining equipment and tools used in contaminated Work Area to remove all contamination, or place in Asbestos Waste Containers prior to being removed from Work Area.

(e) Clean Work Area, Equipment and Access area, washing/Showering Room.

(f) Remove polyethylene sheeting as follows:

(g) Remove contaminated Polyethylene by carefully rolling away from walls to centre of Work Area.

(h) Remove visible fibres or residue found during removal of polyethylene using a HEPA vacuum.

(i) Remove polyethylene protection and hoarding walls

(j) Remove remaining polyethylene sheeting, tape and seals.

(k) Remove water hoses and shut off at source.

(l) Remove Signs, Hoarding Walls, Decontamination Facilities.

(m) Seal vacuum hoses and fittings, flexible ductwork and all tools used in contaminated work site in 6 mil polyethylene bags prior to removal from Work Area.

(n) Remove temporary lights.

(o) Remove negative air unit prefilters. Dispose of as asbestos contaminated waste.

(p) Remove HEPA filtered negative pressure machines and discharge ducting.

(q) Immediately upon shutting down negative air units, seal air inlet grill and exhaust vent with polyethylene and tape.

E18.16.6 Re-Establishment of Items

(a) Upon completion of work:

(i) Move items that were removed from Work Area prior to work, back into same location within Work Area.

(ii) Remove and disconnect Ground fault Panel, tags and locks from electrical panels and re-energize equipment and items.

(iii) Remove hose bibs installed and repair pipe.

(iv) Remove negative air discharge panel and reinstall glazing to match existing.

(v) Clean Work Area and area beneath any Decontamination Facilities.

(vi) Enable building air handling systems.

E18.17 Measurement and Payment

(a) Asbestos Abatement will be measured and paid in accordance with E11.6.10.

E19. RESTORATION

E19.1 Description

E19.1.1 This specification covers the restoration of work sites.

E19.2 Restoration Works

(a) Regrade sites back to original condition upon completion of work.

(b) Reconstruct asphalt pavements and overlays in accordance with CW3410.

(c) Sidewalks:

(i) Reconstruct existing asphalt sidewalks with 75 mm of Type 1A asphaltic concrete pavement conforming to CW3410. The sidewalk shall be constructed with 50 mm (min) of compacted base material and 150 mm (min) of sub-base material.

(ii) Reconstruct existing non reinforced concrete sidewalks with a 100 mm non-reinforced concrete conforming to CW3325 and SD-228A. The sidewalk shall be constructed with 100 mm (min) of compacted base material.

(iii) Reconstruct of the existing reinforced concrete sidewalks with a 150 mm reinforced concrete conforming to CW3235 and SD-237. The sidewalk shall be constructed with 100 mm (min) of compacted base material. To be used for private approaches.

(d) Reconstruct concrete curbs in accordance with CW3240 and SD-206A.

(e) Sod all grassed areas in accordance with CW3510.

E19.3 Measurement and Payment

E19.3.1 Payment for restoration works will be limited to areas disturbed to facilitate construction. Surface restoration outside of the designated construction areas shall be at the Contractors expense.

E19.3.2 Site Regrading

(a) Regrading of sites to original elevations or as shown on the Drawings will be considered incidental to “Pipeline Access” and will not be measured for payment. No additional payment will be made.

E19.3.3 Asphalt Overlay

(a) Repair of asphalt pavement overtop of existing concrete slabs (overlays) will be measured and paid on a square metre basis at the Contract Unit Price for “Asphalt Overlay over Existing Concrete Pavement” as listed in Form B: Prices.

(b) Payment for “Asphalt Overlay over Existing Concrete Pavement” shall include existing pavement removal, surface preparation, and placement asphalt pavements.

E19.3.4 Concrete Barrier Curb Replacement

(a) the renewal of concrete barrier curbs shall be measured on a linear metre basis and paid for at the Contract Unit Price for “Concrete Barrier Curb Renewal “ as listed in Form B: Prices. Measurement will be made for each linear metre of concrete curb acceptably replaced.

(b) Payment for “Concrete Barrier Curb Renewal” shall include all base and sub base preparation, and the supply and placement of concrete curbing.

E19.3.5 Sidewalk Patches

(a) Construction of sidewalk patches” will be measured on a square metre basis for each type of pavement at the Contract Unit Price for “Sidewalk Patches - Unreinforced concrete up to 100 mm thick” as listed in Form B: Prices. Measurement will be made for each square metre of sidewalk acceptably replaced.

(b) Payment for “Sidewalk Patches - Unreinforced concrete up to 100 mm thick” shall include all base and sub base preparation, supply and placement of concrete and asphalt pavements.

E19.3.6 Sodding

(a) Supply and installation of sod using imported topsoil shall be measured and paid in accordance with CW 3510.

E19.3.7 Asphalt Cap at West Tunnel Shaft

(a) Installation of an asphalt cap at the west tunnel shaft shall be measured on a lump sum basis and paid at the Contract Price for “Install Asphalt Cap over the West Tunnel Shaft” as listed in Form B: Prices.

(b) Payment for “Install Asphalt Cap over the West Tunnel Shaft” shall include all necessary labour and materials to complete the work as specified, including but not limited to manhole risers rings, and the supply and placement of a granular base course.

E20. TREE PROTECTION, PRUNING, AND REMOVAL

E20.1 Description

E20.1.1 This specification covers the pruning and removal of existing trees as required to facilitate construction.

E20.1.2 This specification amends CW 3110 Clearing and Grubbing.

E20.2 Quality Control

E20.2.1 Person performing work shall possess a valid Manitoba Arborists License.

E20.3 Materials

E20.3.1 Wound Dressing

(a) Wound dressing shall be horticultural accepted non-hardening bituminous emulsion, free of materials toxic to callus formation, containing disinfectant for fungal and other diseases.

E20.4 Construction Methods

E20.4.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

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

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

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

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

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

E20.4.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his/her designate.

E20.4.3 Scheduling of Work

(a) The Contractor shall review work with Contract Administrator prior to starting work.

(b) The Contractor shall schedule the work in accordance with the restrictions set out in the federal Migratory Birds Convention Act, 1994.

E20.4.4 Removal

(a) If the Contractor requires removing trees to access the Site or facilitate construction, the Contractor shall submit a plan to the Contract Administrator for review, a minimum of ten (10) Business Days prior to removal. No removals of trees shall be made

without written acceptance by the Contract Administrator and the City of Winnipeg's Forestry Department. The plan shall at a minimum indicate:

(i) Trees requiring removal complete with size and species, and description of requirement for removal.

(b) Replanting requirements will be determined by the level of tree removals proposed and accepted by the Contract Administrator and City of Winnipeg's Forestry Department.

E20.4.5 Pruning

(a) Prune individual trees as indicated by the Contract Administrator. Remove dead, dying, diseased, interfering, objectionable and weak growth in order to promote healthy development suitable to the purpose for which plant material is grown.

(b) Prune in accordance with Agriculture Canada Publication 1505-1977, The Pruning Manual.

(c) Employ clean sharp tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches. Remove dead and injured branches and branches that rub causing damage to bark. Trim trees without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches.

E20.4.6 Cut Back

(a) Eliminate narrow crotches as much as possible; avoid cutting back to small suckers. Remove smaller limbs and twigs to leave foliage evenly distributed.

(b) When reducing overall size, make symmetrical in appearance to maintain tree-like form typical of species.

(c) Do not remove more than one-third of total branching at single operation.

E20.4.7 Repair and Protection

(a) Repair cuts and old scars in accordance with Agriculture Canada Publication 1505-1977, The Pruning Manual.

(b) Paint new cuts 100mm in diameter and over with wound dressing.

E20.5 Measurement and Payment

E20.5.1 Tree protection, pruning and removals will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

PART F - SECURITY CLEARANCE

F1. SECURITY CLEARANCE

F1.1 Each individual proposed to perform the following portions of the Work:

(a) any Work on private property;

(b) any Work within City facilities other than:

(i) an underground structure such as a manhole;

(ii) in areas and at times normally open to the public;

(c) communicating with residents and homeowners in person or by telephone;

F1.1.1 Each Individual shall be required to obtain a Police Information Check from the police service having jurisdiction at his/her place of residence. Or

(a) Sterling BackCheck – for existing account holders, log into your account to send individual invitations to employees requiring security clearance. For those that do not have an account, click on the following link to open an account: https://forms.sterlingbackcheck.com/partners/platform2-en.php?&partner=winnipegcity; or

(b) Commissionaires (Manitoba Division), forms to be completed can be found on the website at: https://www.commissionaires.ca/en/manitoba/home; or

(c) FASTCHECK Criminal Record & Fingerprint Specialists, forms to be completed can be found on the website at: https://myfastcheck.com

F1.2 Prior to the award of Contact, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Contractor shall supply the Contract Administrator with a Police Information Check obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform such Work.

F1.3 Any individual for whom a Police Information Check is not provided, or for whom a Police Information Check indicates any convictions or pending charges related to property offences or crimes against another person will not be permitted to perform any Work specified in F1.1.

F1.4 Any Police Information Check obtained thereby will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.

F1.5 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated Police Information Check. Any individual who fails to provide a satisfactory Police Information Check as a result of a repeated Police Information Check will not be permitted to continue to perform any Work specified in F1.1.