THE CITY OF WINNIPEG

TENDER

TENDER NO. 459-2020

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, November 17, 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 D5.1.

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

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

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

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

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

B5. CONFIDENTIALITY

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

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

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

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

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

B6. ADDENDA

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

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

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

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

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

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

B7. SUBSTITUTES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B8. BID COMPONENTS

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

(a) Form A: Bid/Proposal;

(b) Form B: Prices;

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

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

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

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

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

B9. BID

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

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

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

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

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

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

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

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

B9.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:

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

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

(c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;

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

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

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

B10. PRICES

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

B10.1.1 Notwithstanding C12.2.3(c), prices on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.

B10.1.2 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in 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) N/A

B12. CONFLICT OF INTEREST AND GOOD FAITH

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

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

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B13. QUALIFICATION

B13.1 The Bidder shall:

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

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

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

B13.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

(a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website 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 - .

B13.4 Further to B13.3, the Bidder and/or any proposed Subcontractor completing CIPP Lining must be able to demonstrate the following specific qualifications in accordance with B13.10:

(a) Three (3) examples of successful CIPP installations in non-circular sewers with an internal height equal to or greater than 1500 mm;

(b) Three (3) examples of successful CIPP installations utilizing continuous temperature monitoring systems.

(c) One (1) example of a successful CIPP installation requiring active mainline and sewer service flow control.

(d) 20 km of CIPP sewer lining completed within the last five (5) years.

B13.5 Further to B13.3, the Bidder and/or any proposed Subcontractor completing Segmental Sliplining using GRP composites must be able to demonstrate the following specific qualifications in accordance with B13.10:

(a) Three (3) examples of successful GRP sliplining installations in non-circular sewer installations with an internal height equal to or greater than 1500 mm;

(b) One (1) example of a successful GRP sliplining installations requiring active mainline and sewer service flow control.

(c) 2 km of GRP sewer sliplining completed within the last five (5) years.

B13.6 Further to B13.3, the Bidder and/or any proposed Subcontractor completing a CCCP (or Geopolymer) liner installation must be able to demonstrate the following specific qualifications in accordance with B13.10:

(a) Three (3) examples of successful CCCP (or Geopolymer) installations in pipelines with an internal height equal to or greater than 1500 (circular or non-circular);

(b) One (1) example of a successful CCCP (or Geopolymer) installation in a non-circular pipeline with an internal height equal to or greater than 1500; and

(c) One (1) example of a successful CCCP (or Geopolymer) installation requiring active mainline and sewer service flow control.

(d) 2 km of CCCP (or Geopolymer) installation completed within the last five (5) years.

B13.7 Further to B13.3, the Bidder and/or any proposed Subcontractor completing the CIPP, GRP segmental sliplining, or CCCP/Geopolymer installation must be able to demonstrate the following specific qualifications for key personnel, including but not limited to the project manager and foreman, in accordance with B13.10:

(a) Three (3) examples of successful installations utilizing the proposed rehabilitation technology in circular or non-circular sewer cross sections with a minimum internal height of 1500 mm.

(b) One (1) example of a successful installation requiring active mainline and sewer service flow control.

B13.8 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 each of the rehabilitation method(s) proposed:

(a) Site plan(s) indicating where each type of system is to be used;

(b) Material manufacturer(s);

(c) Historical material properties and testing results to be used in the design. This shall include both demonstration and type testing requirements outlined in E11, E13 and E14. Where historical testing data meeting the requirements noted herein are not available, provide acceptable equivalent data and a concise plan for obtaining all requested testing information prior to proceeding with the planning stages of the project and installation of the liners.

(d) Provide quality assurance procedures meeting the requirements outlined in E11, E13, and E14 and the requirements of the proposed rehabilitation system(s).

B13.9 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/.

B13.10 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. 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 personnel must be accompanied by a project specific submission for each referenced project, complete with all identified reference contact information.

B13.11 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. FORM OF CONTRACT DOCUMENTS

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

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of trenchless rehabilitation of six (6) large diameter circular and non-circular sewers in the city of Winnipeg.

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

(a) Mobilization to the Site(s);

(b) Traffic control;

(c) Flow control;

(d) Develop access to the sewers at each site location;

(e) Sewer cleaning, preparation, and inspection;

(f) Trenchless rehabilitation of the identified sewers; and,

(g) Site restoration.

D4. DEFINITIONS

D4.1 When used in this Tender:

(a) ”**ASTM**” means American Society for Testing and Materials;

(b) “**ACI**” means American Concrete Institute;

(c) “**AWWA**” means American Water Works Association;

(d) “**CPR**” means Canadian Pacific Railway;

(e) “**CSA**” means Canadian Standards Association;

(f) “**IGN**” means Information and Guidance Notes;

(g) “**ISO**” means International Organization for Standardization;

(h) “**WIS**” means Water Industry Standard;

(i) “**GRP**” means glass reinforced plastic;

(j) “**CIPP**” means cured-in-place pipe;

(k) “**FRP**” means fibre reinforced polymer;

(l) “**CFRP**” means carbon fibre reinforced polymer;

(m) “**GFRP**” means glass fibre reinforced polymer;

(n) “**CCCP**” means centrifugally cast concrete pipe. For the purposes of this document the term CCCP includes geopolymer based products;

(o) “**Geopolymer**” means a geopolymer based mortar repair system for buried infrastructure;

(p) "**Segmental Sliplining**" means the installation of discrete pipe segments within the host pipe. Liner segments are grouted in place after installation; Notwithstanding C1.1, when used in this Tender:

(q) "**Host Pipe**" means the existing sewer intended for rehabilitation through the installation of various trenchless repair methods.

(r) "**Partially Deteriorated**" means the host pipe can support the soil and surcharge loads throughout the design life of the rehabilitated pipe. Liners for partially deteriorated pipes are shall be designed to account for external hydrostatic pressure only;

(s) "**Fully Deteriorated**" means the host pipe is not structurally sound and cannot support soil and live loads or is expected to reach this condition over the design life of the rehabilitated pipe. Liners for fully deteriorated pipes shall be designed to support all overburden loads, including: soil, live, and external hydrostatic pressure;

(t) "**Site 1**" means the City of Winnipeg combined sewer asset number S-MA20016321, located on Bannatyne Ave between Rorie Street and John Hirsch Place, and as shown on the drawings.

(u) "**Site 2** means the City of Winnipeg combined sewer asset number S-MA20018612, located on Bannatyne Ave between Furby Street and Lydia Street, and as shown on the drawings.

(v) "**Site 3**" means the City of Winnipeg combined sewer asset number S-MA20019010, located on Logan Ave between Laura Street and Ellen Street, and as shown on the drawings.

(w) "**Site 4**" collectively refers to the following City of Winnipeg combined sewer assets, and as shown on the drawings:

(i) S-MA50004315 – Metcalfe Avenue west of St Mary's Road.

(ii) S-MA50004316 – Metcalfe Avenue west of St Mary's Road, immediately downstream of S-MA50004315.

(iii) S-MA50004336 – Metcalfe Ave west of St. Mary's Road, immediately downstream of S-MA50004316

(iv) S-MA70003174 – St Mary's Road between Metcalfe Avenue and Carriere Avenue.

D5. CONTRACT ADMINISTRATOR

D5.1 The Contract Administrator is AECOM, represented by:

Nathan Kehler, P. Eng.
Municipal Engineer

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

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

D6. CONTRACTOR'S SUPERVISOR

D6.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D7. NOTICES

D7.1 Except as provided for in C22.4, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid/Proposal.

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

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

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No.: 204 947-9155

D8. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

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

D10. SAFE WORK PLAN

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

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

D10.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

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

(a) commercial general liability insurance, in the amount of at least two million dollars ($2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability 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.

D11.2 Deductibles shall be borne by the Contractor.

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

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

D12. CONTRACT SECURITY

D12.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond until the expiration of the warranty period in the form of:

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

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

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

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

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

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

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

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

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

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

D12.2 The Contractor shall provide the City Solicitor with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

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

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

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

D13. SUBCONTRACTOR LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least 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. EQUIPMENT LIST

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

D15. DETAILED WORK SCHEDULE

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

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

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

all acceptable to the Contract Administrator.

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

(a) Pre-Design inspections;

(b) Mobilization(s) to site;

(c) Preparation of site access at each site;

(d) Sewer cleaning and prep work;

(e) Installation of structural sewer liner, and

(f) Planned breaks in construction pursuant to D17.7.

D15.4 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

D16. COMMENCEMENT

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

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

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

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

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

(iii) the Safe Work Plan specified in D10;

(iv) evidence of the insurance specified in D11;

(v) the contract security specified in D12;

(vi) the Subcontractor list specified in D13;

(vii) the equipment list specified in D14; and

(viii) the detailed work schedule specified in D15.

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

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 thirty-five (35) consecutive Working Days of the commencement of the Work as specified in D16, or by July 30, 2021, 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.

D19. TOTAL PERFORMANCE

D19.1 The Contractor shall achieve Total Performance within forty-five (45) consecutive Working Days of the commencement of the Work as specified in D16, or by September 10, 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.

D20. LIQUIDATED DAMAGES

D20.1 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

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 – One Thousand Seven Hundred Dollars ($1,700).

(b) Total Performance – Seven Hundred Dollars ($700).

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, directives from health authorities and various levels of government and in close consultation with the Contract Administrator.

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

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

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

D21.5 The Work schedule, including the durations identified in D18 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 B13.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4.

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 D11, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and its Ministers, officers, employees, and agents shall be added as additional insureds.

D27.4.2 If not already required under the insurance requirements identified in D11, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

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

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.

D27.7.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D27.7.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 459-2020

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM H2: LABOUR AND MATERIAL PAYMENT BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 459-2020

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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 D13)

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

Name	Address

FORM K: EQUIPMENT
(See D14)

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D14)

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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)

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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)

2020 SEWER RENEWALS – LARGE DIAMETER NON-CIRCULAR SEWERS – CONTRACT 2

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	Host Pipe Conditions
B	Design Conditions
C	Traffic Control General Requirements
D	Design Curves
E	Site Photos
F	Record Drawings
G	AECOM Confined Space Entry Procedure

Drawing No.	Drawing Name/Title
12591	G-0001 – Cover Sheet
12592	C-1001 – BANNATYNE AVENUE – RORIE STREET TO JOHN HIRSCH PLACE
12593	C-1002 – BANNATYNE AVENUE – FURBY STREET TO LYDIA STREET
12594	C-1003 – LOGAN AVENUE – LAURA STREET TO ELLEN STREET
12595	C-1004 – METCALFE AVENUE
12596	C-1005 – ST MARY'S ROAD – METCALFE AVENUE TO CARRIERE AVENUE
12597	C-4001 – MISCELLANEOUS SECTIONS AND DETAILS

E2. SHOP DRAWINGS

E2.1 Description

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

(b) The term "Shop Drawings: means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work.

E2.2 Submit all Shop Drawings in accordance with CW 1110 except as modified herein.

E2.3 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 Shop Drawings.

E2.4 Submit Shop Drawing submissions within five (5) Business Days of a request as indicated in E2 or receipt of Notice of Award in accordance with B19, whichever is earlier.

E2.5 Allow for a five (5) Business Days period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.

E2.6 Shop Drawings not meeting the requirements of CW 1100 or the requirements specified herein will be returned to the Contractor without review for resubmission.

E2.7 Shop drawing submissions will be limited to 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 charged to the Contractor.

E2.8 Measurement and Payment

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

E3. CONFINED SPACE ENTRY

E3.1 Description

(a) This Specification shall outline minimum requirements for confined space operations through the course of the work.

E3.2 General

E3.2.1 The Contractor shall be aware that Hydrogen Sulphide Gas is present in all underground structures connected to the City's sewer systems and has been known to accumulate in concentrations sufficient to cause serious harm or death to personnel who are not using adequate Personal Protective Equipment.

E3.2.2 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).

E3.2.3 The Contractor is responsible for all safety and confined space support throughout the project.

E3.3 Methods

E3.3.1 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 sewer or manhole. 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 defect;

(ii) location of the defect in the sewer/manhole;

(iii) structural condition and amount of debris in the remaining sewer/manhole;

(iv) condition of the manholes up and downstream of the required repair;

(v) atmospheric conditions in the manholes up and downstream of the required repair;

(vi) condition of adjacent downstream sewers; and,

(vii) flow in the sewer.

(b) The hazard assessment shall be based on the Contractors review of video for the sewer(s) and site inspection of the manholes, sewers and external conditions. Prior to the inspection, the Contractor shall conduct the necessary atmospheric monitoring of the affected manholes and sewers to establish acceptable entry conditions.

(c) Based on the results of the hazard assessment the Contractor shall determine if they can perform the stabilization repairs in a safe manner. If the Contractor decides to proceed with the internal repairs, they shall prepare a Safe Work Plan complete with the necessary controls and procedures required to maintain a safe working environment for the repair. Otherwise they shall notify the Contract Administrator and jointly the Contractor and the Contract Administrator shall review the nature of the work and determine alternative means of completing the work are required.

E3.3.2 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 and on the ground's surface;

(viii) current and forecasted weather conditions;

(ix) isolating the workspace by plugging of upstream sewers and monitoring of upstream flow levels;

(x) provision of back-up equipment;

(xi) method of ingress into the sewer; and,

(xii) method of egress out of the sewer – forward and backwards.

(b) The Contactor shall not enter the sewer or manholes 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.

E3.3.3 Enter the Manhole and Sewer

(a) The Contractor shall enter the manhole/sewer and complete the work in accordance with their safe work plan and requirements for the repair contained herein.

(b) If at any time during the repair the attendant and/or Contractor believes he cannot safely perform the work, they shall immediately stop the work and evacuate the sewer and manholes. The Contractor shall re-assess their safe work plan considering the reason for the work stoppage. The work shall only be resumed when the Contractor has deemed it safe to return by completing a re-assessment and safe work plan revision, where necessary.

(c) If the Contractor deems the work cannot be safely completed by internal stabilization, they shall notify the Contract Administrator and jointly the Contractor and the Contract Administrator shall review the nature of the defect and determine alternative means of completing the work are required.

E3.3.4 Third Party Inspections

(a) The Contractor shall be aware that third party inspections requiring confined space entry within the sewers may be required to confirm prep work and QA testing for Type 1 GRP and CCCP/Geoploymer rehabilitation techniques. Where third party

inspections have been identified by the Contract Administrator the Contractor shall support the confined space entry as identified herein.

(b) The Contractor's Safe Work Plan and confined space entry procedures for inspections involving AECOM personnel shall meet or exceed all requirements outlined in AECOM's Safe Work Procedure, attached in Appendix G.

(c) The Contractor shall provide confined space support for third party inspections. AECOM and City personnel 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.

(d) Unless otherwise authorised, the Contractor shall have flow control measures in place for all manned inspections of the pipeline;

(e) The Contractor shall ensure the following minimum requirements are met for all third party inspections involving AECOM and City personnel:

(i) The upstream sewer shall be isolated from the work space to prevent hazardous atmospheric conditions from entering the work space; and,

(ii) The work space shall be ventilated to achieve a minimum of 7 air exchanges per hour. A full ventilation of the confined space is required prior to entry. The contractor shall provide evidence of ventilation calculations to achieve the required air exchanges.

(f) If the Contractor is unable to adequately mitigate atmospheric hazards within the work space to the satisfaction of the confined space entrants, the provision of an on-site confined space rescue team may be required.

(i) Inspections may be delayed or postponed where onsite confined space procedures, hazard mitigation measures, or confined space entry support do not meet the Contractors 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.

E3.4 Measurement and Payment

E3.4.1 Confined Space Entry

(a) Performing hazard assessments, preparing a Safe Work Plans, and confined space entry support for the Work and inspections will be considered incidental to the Work and will not be measured for payment. No separate payment will be made.

E4. MOBILIZATION AND DEMOBILIZATION

E4.1 Description

(a) This Specification shall govern mobilization and demobilization from site.

E4.2 Measurement and Payment

E4.2.1 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:

(i) 25% payment of the Mobilization and Demobilization lump sum price will be paid once sewer cleaning and preparation crews arrive on site and commence with cleaning and sewer preparation works.

(ii) 50% payment of the Mobilization and Demobilization lump sum price will be paid once lining crews arrive on site and commence CIPP liner installations.

(iii) 100% of the Mobilization and Demobilization lump sum price will be paid subsequent to completion of the liner installation, liner repairs (if necessary), manhole restoration, and site cleanup.

E5. TRAFFIC MANAGEMENT

E5.1 Description

(a) This Specification shall govern traffic control.

E5.2 Submissions

E5.2.1 The Contractor shall submit a detailed traffic control plan for works occurring at each separate site. The traffic control plan(s) shall be submitted a minimum of ten (10) Business Days prior to commencement of work on each site. Traffic control plans shall include, but not necessarily be limited to, the following:

(a) Details of lane closures on regional and non-regional streets; detours; access accommodations for local businesses; and access accommodations for pedestrians throughout any and all stages of construction;

(b) Traffic control coordination with flow bypass works, including traffic ramp locations;

(c) construction and flow bypass staging/schedule.

E5.2.2 Regional Street Lane Closures

(a) 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.

(b) Requests for full or directional closures, median cross-overs, speed limit reductions, or designated construction zones shall be submitted to the Contract Administrator a minimum of fifteen (15) Business days prior to the planned work.

(c) Requests for regional lane closures shall include all required information for submission required by the City’s online request form. It is recommended that the Contractor fill out the online form, print to pdf, and submit the pdf to the Contract Administrator.

(d) A link to the form can be found here: https://www.winnipeg.ca/publicworks/transportation/roadConstructionLaneClosures.stm

E5.2.3 All submitted traffic control plans are subject to review and acceptance by City of Winnipeg Traffic Management and Traffic Services divisions.

E5.3 General

E5.3.1 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.

E5.3.2 Maintain access for approaches, driveways, public lanes and crossing streets for all locations.

E5.3.3 Bus traffic must be maintained at all times or as accepted by the Contract Administrator.

E5.3.4 The Contractor shall maintain access to all businesses during business hours, except where written authorization has been provided by the business.

E5.3.5 The Contractor shall maintain access to all schools, community centres, and other public buildings at all times.

E5.3.6 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.

E5.3.7 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.

E5.3.8 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.

E5.3.9 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.

E5.3.10 Notwithstanding the requirements noted herein and CW 1130, the Contractor shall maintain the minimum site-specific traffic control requirements outlined in Appendix C - Traffic Control General Requirements and as indicated on the Drawings.

E5.4 Regional Street Lane Closures

E5.4.1 Construction activities on Regional Streets shall be restricted to the closed lanes between 07:00 to 09:00 hours and 15:00 to 18:00 hours Monday to Friday and other hours as outlined herein or directed by the Contract Administrator.

E5.4.2 The City reserves the right to restrict or cancel Regional Street lane closures at any time due to the occurrence of special events or conflicting third party work.

E5.5 Residential Streets

(a) Further to the specified requirements indicated in Appendix C and on the Drawings, the contractor shall strive to maintain at least one lane of traffic on residential streets. Where a lane of traffic cannot be maintained, the Contractor shall clearly close the street at the work zone to prevent damage to the boulevard and other surface features. All streets shall be signed as “Road Closed - Local Access Only”.

(b) A minimum of one lane of traffic shall be maintained on one-way residential streets at all times.

(c) Where 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.

E5.6 Measurement and Payment

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

E6. FLOW CONTROL

E6.1 Description

(a) This Specification shall cover flow control measures required for main line sewer and sewer services required to perform the work.

E6.2 Submittals

(a) Submit a written flow control plan for sewers to be lined for review by the Contract Administrator in accordance with E2, a minimum of five (5) Business Days prior to undertaking the work. The flow control plan shall include the following:

(i) A description and sketch detailing the arrangement of the proposed flow control measures.

(ii) A list of the key components required for the flow control measures, including but not limited to the following:

(i) Cofferdams

(ii) Piping or hoses (where required)

(iii) Pumps (where required)

(iii) A detailed procedure for installation and removal of the flow control measures.

(iv) Monitoring plan (if required). Note: all plans shall include a 24 hr contact person.

(v) Means and methods for dealing with excessive flows or wet weather events.

(vi) Means and methods for bypassing flows from apartment complexes and commercial buildings.

(vii) Supply of temporary washroom facilities where required.

(b) A tabular flow control plan is acceptable for assets 450 mm in diameter and smaller.

(c) Flow control plans shall be prepared and stamped by a professional Engineer, registered in the Province of Manitoba and experienced in the design and implementation of temporary flow bypass works.

E6.3 Methods

(a) Provide necessary flow control measures for the main line sewer and sewer services required to perform the work. Diversion of wastewater flow directly or indirectly to the environment, land drainage sewers, or storm relief sewers will not be allowed.

(b) Maintain existing sewer flows from upstream sewers during construction around the sewers being lined.

(c) Where bypass pumping combined sewer flows, the Contractor shall provide a minimum pumping capacity of 2.75 times the estimated average day flows as provided herein or measured by the Contractor.

(d) Erection of scaffolding overtop of active roadways will not be permitted for the purposes of flow control.

(e) Provide adequate temporary bypass pumping for live sewer services connected to the sewer being lined from when the service is blocked off until it is reinstated.

(f) Provide security personnel for locations where by-pass pumping requires normally secure or locked doors and access areas to be left open or unlocked.

(g) Ensure all flow control components and materials are removed from the sewer system upon completion of the work.

E6.3.1 Mainline Sewer Flows

(a) The Contractor shall ensure wet weather or excessive flow conditions can be pumped or otherwise accommodated through the work area. The Contractor shall schedule work requiring complete blockage of the sewer when the chances of wet weather events are minimized in accordance with E6.3.4.

(b) The Contractor shall determine appropriate sewer bypass flows for all sewer assets 450 mm and smaller. Submit flow control plans in accordance with E6.2. Flow control plans for sewers 450 mm and smaller in diameter are not required to be stamped by a Professional Engineer.

(c) For sewers greater than 450 mm in diameter, Average Dry Weather Flows (ADWF) and/or Average Day Flows (ADF) have been provided for the purposes of sizing bypass systems and may be found in below. Submit flow control plans in accordance with E6.2. Flow control plans for sewers greater than 450 mm in diameter shall be stamped by a Professional Engineer, registered in the Province of Manitoba and experienced in the design and implementation of temporary flow bypass works:

(i) Bannatyne Ave (S-MA20016321): 42.1 L/s

(ii) Bannatyne Ave (S-MA20018612): 12.6 L/s

(iii) Logan Ave (S-MA20019010): 12.7 L/s

(iv) Metcalfe Av (S-MA50004315 & S-MA50004316): 6.5 L/s

(v) St Mary's Rd (S-MA70003174): 2.7 L/s

(d) Notwithstanding E6.3.1(b) and E6.3.1(c) the following assets may exhibit intermittent flows resulting from the operation of upstream pump stations. The following information has been provided for the purposes of sizing bypass systems. Submit flow control plans in accordance with E6.2. Flow control plans shall be stamped by a Professional Engineer, registered in the Province of Manitoba and experienced in the design and implementation of temporary flow bypass works:

(i) N/A

E6.3.2 Site Specific Flow Control Requirements

(a) Metcalfe Av - S-MA50004316

(i) Site 4 is located immediately upstream of the Metcalfe Flood Pumping Station.

(ii) Dry weather are conveyed to the Lyndale Commuter Station located in the lane between Metcalf Ave and Lyndale Dr via a 300 mm secondary sewer (S-MA50004317). Bypass flows may be discharged into S-MH50003714, but pumping rates may not those identified below.

(iii) There are several homes connected to the 300 mm secondary sewer (S-MA50004319) which are at an elevated risk of basement flooding when the connection to the overflow is blocked. Thus, an open 300 mm connection between MH50003714 and MH50003719 shall be maintained at all times when installing GRP and CCCP liners and shall be maintained to the greatest extent possible when installing CIPP liners. The connection shall be opened up as soon as practical after installation of CIPP liner.

(iv) Maximum bypass discharge rate into downstream 300 mm sewer (S-MA50004318) shall be limited to 28.9 L/s.

E6.3.3 Sewer Services

(a) Intermittent/short term flow blockages (i.e. up to 1 day, intermittently) of live sewer services will be permitted on the proviso that building occupants are informed of the blockage and adequate steps are undertaken to ensure sewer service backups do not occur. The Contractor shall be responsible for any damages occurring from sewer service blockages in instances where inadequate or improper notice has been provided.

(b) Provide temporary indoor portable toilets for residential homes and for each apartment in small apartment buildings (10 or less apartments) instead of temporary sewer service bypass pumping where feasible and approved by the building owner and the Contract Administrator.

(c) Provide temporary indoor or outdoor toilet facilities for smaller commercial properties such as strip malls instead of temporary sewer service bypass pumping where feasible and approved by the building owner and the Contract Administrator. One toilet facility to be provided for each business in a strip mall.

(d) Provide necessary supplies for portable toilets and clean as often as required while in use. Remove portable toilets and outdoor toilets promptly once sewer service is reinstated.

(e) Expose sewer services for facilities with a high volume of effluent discharge that have no feasible means of intercepting the flow within the building or at a location outside the building agreed upon by the Contract Administrator and drain or pump the sewer service from that location until the sewer service is reinstated.

(f) Excavate for sewer service exposure in accordance with CW 2030. Repair and backfill exposed sewer services in accordance with CW 2130.

E6.3.4 Weather

(a) Review the Environment Canada weather forecast with the Contract Administrator before each day of liner installation.

(b) Delay installation of liners and/or secure Works when the anticipated weather conditions are such that anticipated sewer flow will exceed the flow control measures provided.

(c) The Contractor shall advise immediately of any weather-related delays.

(d) The Contractor to schedule Work according to the weather; The City is not responsible for costs associated with weather related delays.

E6.4 Measurement and Payment

(a) Flow control measures necessary for mainline sewers will be measured on a lump sum basis and paid at the Contract Lump Sum price for “Flow Control” for each respective site indicated on Form B. Only one unit of flow control will be paid for each site.

(b) Payment for “Flow Control” shall include, but is not limited to the following:

(i) Supply of flow control plans, drawings, and submissions;

(ii) Investigative work to confirm flows, manhole, and pipe configurations;

(iii) Supply, installation, and removal of cofferdams and flow diversions;

(iv) Supply, mobilization, monitoring, operation, and demobilization of pumps and hoses;

(v) Hydrovac, hauling, and disposal of sewage where required for flow control purposes;

(vi) Traffic signage;

(vii) Supply, installation, and removal of all traffic ramps and associated materials;

(viii) Any and all other plant, materials, and labour required to complete the work as specified herein and identified on reviewed flow control plans.

(c) Utilization of flow control shall constitute the deployment of pumps or hauling of sewage to bypass flows around a sewer being lined. Flow control will not be measured where no flow control measures are utilized.

(d) Where flow control is measured and paid for each site:

(i) 25% payment for the Contract Lump Sum price for each respective site will be paid when flow control measures have been mobilized to that site and are in operation.

(ii) 100% of the Contract Lump Sum price for each respective site will be paid subsequent to the completion of the liner installation and demobilization of flow control measures from that site.

(e) Where no flow control measures are undertaken, no payment will be made for this item of work.

(f) The supply of temporary washroom facilities and flow control measures for sewer services shall be considered incidental to installation of the liner and will not be measured for payment. No additional payment will be made.

E7. SEWER INSPECTIONS

E7.1 Description:

(a) This specification describes the requirements for obtaining sewer measurements and CCTV inspections required to facilitate the specified rehabilitation work.

(b) This specification amends and supplements specification CW 2145.

E7.2 Methods

E7.2.1 Verification of Existing Sewer Dimensions

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

(i) Measure the distance from the centre of the start manhole to centre of the finish manhole in accordance with E7.5.8(a).

(ii) Manhole invert depths (from the manhole rim) at the upstream, downstream, and any intermediate manhole.

(iii) Measure the diameter and cross-section of the sewer at the upstream and downstream manholes and at a minimum distance of 500 millimetres inside the sewer from each manhole.

(iv) 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

(v) Obtain additional measurements for large diameter (larger than 600 millimetres) and for non-circular sewers sufficient to define the cross section to meet the design objectives for the rehabilitation system being utilized, including but not limited to:

- The length of the inside perimeter (circumference) of the sewer at the upstream and downstream ends.
- Perform a pre-design inspection in accordance with E7.2.2(b) where specified in order to confirm the dimensions of the existing host pipe.

(b) Estimate the remainder of the sewer dimensional requirements based on dimensional checks and the CCTV sewer inspection videos.

(c) Submit host pipe lengths, depths, and dimensions to the Contract Administrator in conjunction with the design submission and pre-design inspection where required.

E7.2.2 Perform the following sewer inspections in accordance with CW 2145 and as outlined herein:

(a) Pre-Repair Inspection:

(i) Perform prior to undertaking cleaning, repairs, or prep-work.

(ii) Except where identified in Appendix A, pre-repair inspections are not a pay item and shall be considered incidental to the cleaning and prep work operations.

(iii) Except where identified in Appendix A, submission of the pre-repair inspection is only required where sewer conditions differ from those identified during tendering and additional prep work was undertaken to complete the rehabilitation work.

(iv) Where identified in Appendix A, pre-repair inspections shall be completed a minimum of forty (40) Business Days prior to lining and submitted to the Contract Administrator for review prior to undertaking repairs or prep-work on the identified assets.

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

(b) Pre-Design Inspection (where specified):

(i) Perform prior to preparing the liner design.

(ii) Intent is to confirm the continuous or discontinuous (every 5 metres minimum) measurement of the height and width of large diameter and non-circular sewers along the entire length of the sewer.

(iii) The following methods may be employed:

- Hand measurements
- Laser profiling
- Templating (Segmental Sliplining only)

(iv) CCTV inspections involving hand measurements shall clearly show the dimensional measurements and distance of the measurement from the upstream manhole on the video. Distances based on CCTV cable measurement will be permitted.

(v) Any change in sewer cross section shall be sufficiently dimensioned to permit design and post-lining assessment of liner dimensions. Where hand measurements are utilized, any changes in the sewers cross sectional shape shall be documented in accordance with E7.2.1.

(vi) CCTV inspections involving templating shall clearly show the passage of the template through the sewer. For templated sewers the dimensions of the template shall be measured visibly on the CCTV inspection and dimensions submitted for review with the pre-design inspection.

(vii) Laser profiling technology must have sufficient accuracy and replicability as per E7.6.3 and must capture the entire circumference of the pipe.

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

(c) Pre-Lining Inspection:

(i) Perform after sewer cleaning and preparation.

(ii) The Pre-Lining Inspection shall confirm:

- Necessary cleaning and pipe preparation work, including internal and external sewer repairs, have been satisfactorily completed.
- Condition of the sewer 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.

(iii) Provide the Pre-Lining CCTV inspection a minimum of five (5) Business Days prior to lining for approval to proceed with the liner installation.

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

(d) Post-Lining Inspection:

(i) Perform immediately following installation of the liner, after completion of sewer service reinstatement, and while flow control measures are in place.

(ii) Perform Post-Lining Inspection where Regional Street lane closures are required within 24 hours of completing the installation of the liner.

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

(iv) Post-Lining inspection shall be submitted within fifteen (15) Business Days of completion of the liner installation. Substantial Performance and Total Performance for the project will not be granted prior to submission and acceptance of the Post-Lining inspection CCTV and associated reports.

(v) Full coding required.

(e) Post-Design Inspection (where specified):

(i) Perform subsequent to installing the liner.

(ii) Intent is to confirm the continuous or discontinuous (every 5 metres minimum) measurement of the height and width of large diameter and non-circular liners

along the entire length of the sewer to confirm that the liner is consistent with the expected post-lining diameter or dimensions.

(iii) The following methods may be employed:

- Hand measurements
- Laser profiling

(iv) Perform while flow control measures are in place.

(v) CCTV inspections involving hand measurements shall clearly show the dimensional measurements and distance of the measurement from the upstream manhole on the video. Distances based on CCTV cable measurement will be permitted.

(vi) Laser profiling technology must have sufficient accuracy and replicability as per E7.6.3 and must capture the entire circumference of the pipe.

(vii) Sewers rehabilitated via Segmental Sliplining with GRP do not require a post-design inspection unless requested by the Contract Administrator. No payment will be made for a post design inspection for slip lined GRP sewers unless requested by the Contract Administrator.

(viii) Post-Design inspection shall be submitted within fifteen (15) Business Days of completion of the liner installation. Substantial Performance and Total Performance for the project will not be granted prior to submission and acceptance of the Post-Design inspection CCTV and associated reports.

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

(f) Warranty Inspection:

(i) Perform before expiration of the warranty period and final acceptance but not prior to 10 months after installation of the liner.

(ii) Intention is to confirm the fit and finish of the liner, the need for any remedial work, and acceptance of any repair work performed during the warranty period.

(iii) Undertake sewer cleaning in accordance with CW 2140 as required to obtain a satisfactory inspection.

(iv) Full coding required.

E7.2.3 Submit all inspection videos to the Contractor Administrator for review in accordance with CW 2145 and as specified herein.

E7.3 Sewer Inspection Reports

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

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

(ii) Warranty inspection report before Final Acceptance of the Work.

E7.4 Sewer Service Reports

(a) The Contractor is responsible to determine the usage and status of all service connections connected to the sewer to be rehabilitated. Confirm exact location of all sewer services connected to the sewer being lined by dye testing, tracing, or other methods. Any additional investigative and/or remedial work resulting from improper identification of connected services shall be borne by the Contractor.

(b) Submit a written Sewer Service Report for each liner location to the Contract Administrator a minimum of five (5) Business Days prior to installation of liners. Provide the following information for each sewer service including CB leads and utility manhole drains.

(i) Location of connection (chainage from upstream manhole and clock reference).

(ii) Diameter of sewer connection lateral.

(iii) Material type of sewer connection.

(iv) Observed condition of connection.

(v) Status of connection (active, inactive or unable to determine).

(vi) Property serviced including the address.

(c) Sewer Service Reports shall be submitted in conjunction with the Pre-Lining CCTV Inspection submission.

E7.5 Amendments and Supplements to CW 2145:

E7.5.1 Replace Section 3.4 with:

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

(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.

E7.5.2 Replace Section 3.5 with:

(a) Perform sewer condition coding in accordance with the requirements of the NASSCO PACP and to Version 7.0.0 of the manual, or greater in accordance with E7.5.1 of this specification, 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
	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

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	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
	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.

E7.5.3 Further to CW 2145 Clause 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.

E7.5.4 Further to Section 3.13, a paper or “hard copy” of the sewer inspection reports is not required and the digital format should be submitted on a CD-R.

(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) The Contractor shall supply inspection data for review by the Contract Administrator on a DVD.

(c) The Contractor shall supply separately one (1) set of archival grade digital versatile discs, DVD-R format in accordance with E7.5.7 to the City upon completion of the project.

E7.5.5 The Contract drawings are based on information contained in the City’s GIS database. If the Contractor has trouble interpreting the drawings, or if they believe them to be wrong, the Contract Administrator shall be approached for assistance/clarification.

(a) The Contractor shall assist the Contract Administrator in making any required measurements for the correction of errors found on the Drawings.

E7.5.6 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.

E7.5.7 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 E7.5.5 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.

E7.5.8 Replace Clause 3.16.1 with:

(a) Measure the distance between the centre of the start and finish manholes on the ground surface above the sewer to the nearest 0.01 of a metre using a survey grade ISO 16331-1:2012(E) approved outdoor laser distance measurer capable of attaining 150m minimum steel tape distance, or alternative measuring methods approved by the Contract Administrator, before beginning the sewer inspection. The centre of the manhole will be based on the centre of the manhole cover regardless of the manhole configuration. If bends are identified to exist within the sewer segment, the Contractor shall approximate the measurement on the ground surface using incremental distances to the approximate alignment of the sewer between the start and finish manholes, to the approval of the Contract Administrator’s Site Inspector.

E7.5.9 Further to Clause 3.17.7.8:

(a) Service connection tap observation distances must occur at the centre of the tap and the side periphery. To determine use and deficiencies of the tap, the camera must continue to travel, camera centred in the perspective view (to capture other observations), to stop perpendicular to the tap and pan so that the camera can view directly into the barrel of the lateral, to enable the inspector to apply modification and descriptor codes to the tap as per NASSCO PACP standards as necessary.

E7.5.10 Replace Clause 3.17.7.6, with:

(a) 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.

E7.5.11 The sewer inspected distance shall represent the distance from the center of the start to the center of the end manhole, access or control structure unless incomplete as per Section 3.19.2.

E7.5.12 Further to Section 3.19.2, incomplete inspections for sewer and manhole inspections shall be communicated to the Contract Administrator, indicating the date and time of the attempt, reasoning, efforts and actions set out by Section 3.19.

E7.5.13 Further to Section 3.19.2, manholes identified being in a surcharged environment (standing water) or in imminent failure shall be communicated to the Contract Administrator, indicating the issues observed in the inspection.

E7.5.14 Further to Section 3.22.1, clear water infiltration observations shall be communicated to the Contract Administrator, providing asset number, location, date and time of the observation, description with attached screen captures to help facilitate Section 3.19.

E7.6 Sewer Inspection Equipment

E7.6.1 Notwithstanding CW 2145, CCTV equipment meet the following requirements:

(a) In-Line sewer inspection equipment shall be comprised of a self-propelled track-mounted platform bearing multiple inspection sensors / technologies that can undertake simultaneous remote inspection in sewers of all diameter ranges.

(b) In areas where a self-propelled track-mounted platform is not possible to use during the inspections, the inspections shall be performed using a float or skid system. The Contractor shall notify the Contract Administrator prior to the use of a float or skid platform, tethered by use of flusher hosing capable at distances stated in E7.6.2(b).

E7.6.2 Minimum requirements of the in-line inspection platform include:

(a) Independently controlled drive tracks that enable the platform to manoeuvre around bends and climb over debris up to 300mm in height.

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

(c) Operable in sewers of various cross-sections and constructed of standard pipe materials including brick, concrete, PVC, HDPE, and steel.

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

(e) Equipped with sufficient high intensity lighting to illuminate the sewer for visual inspection.

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

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

E7.6.3 Three Dimensional (3D) LASER Scanning Inspection

(a) "Three Dimensional (3D) Laser Scanning" is a technique to determine the surface profile of mainline pipes using a three dimensional (3D) laser on the entire circumference above fluid level of the pipe.

(b) Three Dimensional (3D) LASER scanning equipment shall provide an accurate determination of pipe geometry (features and defects) above the fluid level.

(c) Minimum equipment requirements are:

(i) The laser shall be Class 1; eye-safe for operator safety.

(ii) Surface measurements accurate to 5mm at 3 metres in 1200mm pipes and larger.

(iii) Precision ovality / deflection detailed range laser measurement scans accurate to ±1%.

(iv) Laser scans shall produce a point cloud with a maximum distance between points of 10 mm in the transverse direction and 40 mm in the longitudinal direction. The rate of scan shall not exceed 9 m / minute.

(d) The provision of LASER scanning Internal Diameter and Deflection graphs will be used, as needed, to quantify internal pipe wall material loss/gain or deformation (ovality and deflection) at a given location. Pipe cross-sections obtained from high resolution scans will be used to provide quantitative information regarding internal pipe diameter, including ovality. Precision Scans are produced with multi-colour indication depicting deviations from as built conditions as well as localized material gain and/or loss.

(e) LASER scanning shall be conducted on identified sewer pipe entities and be conducted from access point to access point. LASER equipment shall be moved through the pipeline on a transport vehicle capable of supporting the LASER inspection equipment above the water level.

E7.7 Video Coding

(a) Perform sewer condition coding in accordance with the requirements of the National Association of Sewer Service Companies (NASSCO) “Pipeline Assessment Certification Program” (PACP) and to version 7.0.0 of the manual or better.

(b) Perform condition coding using certified operators in accordance with the NASSCO PACP and MACP. Ensure each operator is fully trained in all aspects of sewer inspection and capable of making accurate observations and recording all conditions that may be encountered in the sewers.

(c) Operators failing to provide copies of their NASSCO certification and / or failing to 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.

(d) Incorporate a suitable distance-reading device to measure the location of the equipment in the pipe, to an accuracy of ±0.5% of the length of the inspection.

E7.8 Measurement and Payment

E7.8.1 Verification of Sewer Dimensions:

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

E7.8.2 Sewer inspections will be measured and paid for in accordance with CW 2145 except as modified herein:

(a) The total length of inspection to be paid will be the total length of sewer inspected to the satisfaction of the Contract Administrator.

(i) The maximum length to be paid will be the manhole to manhole sewer length provided by the Contractor.

(ii) Where partial or incomplete inspections are submitted, the length of sewer inspected will the length recorded by the Contractors calibrated inspection equipment or as determined by the Contract Administrator.

E7.8.3 Sewer Service Reports

(a) Sewer service reports shall be considered incidental to the Work and will not be measured for payment. No separate payment will be made.

(b) The Contractor is responsible for rectifying any damages caused or additional inspection work resulting from incomplete or erroneous Sewer Service Reports.

E7.8.4 Sewer Inspection Reports

(a) Sewer inspection reports measured and paid for in accordance with CW 2145.

E8. DIGITAL PANORAMIC MANHOLE INSPECTIONS

E8.1 Description:

(a) This Specification describes the requirements for obtaining panoramic manhole inspections.

E8.2 Equipment

E8.2.1 Notwithstanding CW 2145, inspect manholes using digital panoramic manhole inspection system such as the IBAK PANORAMO SI, or equivalent meeting the following criteria:

(a) The inspection camera system must be 100% digital. Any analog or NTSC video camera will be deemed unacceptable.

(b) The inspection camera system must have two independently or simultaneously controlled digital cameras, one facing in the downward direction and one facing in the upward direction. Each camera must have a minimum of 185 degree field of view.

(c) The inspection camera system must provide sufficient illumination of the interior of the manhole to obtain proper exposure without introducing any motion blur. The light shall be positioned to distribute the light evenly onto the structure walls. The lighting must be able to illuminate manholes without the need of any auxiliary lighting.

(d) The inspection system shall produce individual images or frames with no more than 0.001 inches (0.025mm) of movement during image or frame exposure to produce crisp, clear images. Inspections showing evidence of scratched lenses or protective due to poor handling and application shall be rejected.

(e) The inspection camera must provide a minimum of 3000 line of vertical resolution in the side view and a minimum of 500 lines in the perspective view.

(f) Contractor is responsible for reviewing collected data, coding observations, however the City must have the ability to view the digital film file in the way that the contractor can view them, including full control of the virtual pan and tilt.

(g) The digital film files must include an unfolded view of the manhole with a minimum of 3000 lines of vertical resolution.

(h) The digital film files must include the capability to produce a three dimensional representation of the manhole structure. This data shall be used to perform geometric measurements. This file shall be exportable to common CAD programs for further analysis.

(i) The digital file files must include a distortion-free virtual pan and tilt allowing the review of the manhole structure from any angle from any depth. The virtual pan and tilt must be able to view 360 degrees in any direction. The virtual pan and tilt must consist of views from the top and bottom camera, any virtual pan and tilts that artificially create this view from a single camera will be deemed unacceptable due to distorted images on the direct side view.

(j) The virtual pan and tilt and unfolded views must be able to be viewable by the City with all the required software included.

(k) All chambers that exhibit weir wall or spill pipe weir levels as observed within the field or identified, but not limited to control structures or manholes identified within the Construction Drawings, must be measured from manhole rim to weir crest where possible and detailed within the Inspection Comments field.

(l) CW 2145 Sections 3.17.8.5, 3.17.8.6, and 3.17.8.7 are not applicable when utilizing digital panoramic methods.

(m) Further to CW 2145 Clause 3.11.5, provide file names within the 360Player.exe software, manholes to be in alpha numeric order to ensure efficient reference.

E8.3 Measurement and Payment

E8.3.1 Provisional manhole inspections will be measured and paid for in accordance with CW 2145.

E9. EXCAVATIONS AND PIPELINE ACCESS

E9.1 Description

(a) This Specification shall cover excavations, shoring, and modifications to and construction of new manholes as required for pipeline access to facilitate the proposed rehabilitation work.

E9.2 Submittals

(a) A work plan shall be provided for each manhole slated for disassembly and/or reconstruction to facilitate liner installation. Work plans are not required where only the manhole frame and cover are being removed. The work plan shall include the following:

(i) Limits of excavation (width, length, depth);

(ii) means of shoring the excavation;

(iii) services to be disrupted. Means of maintaining or otherwise dealing with service flows;

(iv) manhole work to be undertaken; and

(v) other information required to describe the work.

(b) Shop Drawings for excavation shoring (where required) shall be prepared and submitted in accordance with E2 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.

E9.3 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 CIPP liners.

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

E9.4 Materials

(a) All materials shall conform to City of Winnipeg Standard Construction Specifications.

E9.5 Methods

E9.5.1 Manhole Modifications to Facilitate Liner Installation

(a) If required to complete the work, the Contractor may choose to remove and replace the upper portions of the existing manholes to permit access to the existing sewers.

(i) The Contractor may reuse existing pre-cast concrete manhole components when found to be in good condition. The Contractor shall replace all other manhole components and pre-cast concrete manhole components found to be in a deteriorated condition.

(ii) Where manhole stacks are to be replaced and sizes are not noted on the drawings, the new manhole stack shall be the largest practical nominal size up to 1200 mm without exceeding the existing manhole base dimensions.

(iii) Select existing manholes and chambers may not be modified or excavated as shown on the Drawings.

(b) All manhole works shall conform to CW2130.

E9.5.2 Excavation

(a) The Contractor is responsible for locating the existing sewer and all other buried utilities, and shall take all steps to locate the existing sewer prior to excavation and installation of shoring.

(b) Construction materials and excavation spoils shall not be stockpiled over pipelines.

(c) Carefully excavate to expose existing pipelines.

(d) Only smooth edged buckets may be utilized for excavations within 1.5 m of the existing sewer.

(e) The existing sewer shall be located prior to proceeding with excavations within 1.0 m of the pipe. Final excavation (within 300 mm of the pipe wall) shall be completed using soft dig or hand excavation methods to prevent damage to the pipe.

(f) Excess excavation materials shall be disposed of off site.

(g) Any services severed during excavation and shoring installation must be rerouted or otherwise bypassed in accordance with E6.3.3.

E9.5.3 Shoring Installation

(a) Piles (if used) shall be installed with a minimum of 500 mm of clear separation between the pile and the outside of the existing sewer wall.

(b) Piles (if used) shall be pre-bored to a depth below the invert of the sewer. Pre-bored holes shall be filled with a flowable low strength cementitious material after installation of piles to prevent movement of existing soils around the pipe, permit excavation/installation of shoring, and removal of piles.

(c) Excavation and shoring installation shall not initiate movement or otherwise destabilize soils sounding brick and concrete sewers greater than 1200 mm in diameter.

(d) Locate the extents of the existing sewer prior to pre boring and installing shoring using soft dig methods. Please note the wall thicknesses and outside diameter of the existing trunk sewers are unknown.

(e) Construction Vibrations

(i) The Contractor shall use means and methods that will limit vibrations at locations adjacent to utilities and structures.

E9.5.4 Demolition

(a) Carefully remove, expose, and demolish existing manholes and sewers as required. The use of pneumatic breakers is prohibited. Tops of sewers may be saw cut or removed using small hand held jack hammers. Final openings in the existing sewers shall be neatly cut square to the existing pipe.

E9.5.5 Trunk Sewer Closures

(a) Construct trunk sewer closures as shown on the drawings after completion of the liner installation.

(b) Complete cast-in-place concrete and reinforcing steel work as shown on the Drawings and in accordance with E15 and E16.

E9.5.6 New Manholes

(a) Construct new cast-in-place or pre-cast manhole bases as shown on the drawings after completion of the liner installation.

(b) Complete cast-in-place concrete and reinforcing steel work as shown on the Drawings and in accordance with E15 and E16.

(c) Manholes shall be constructed as shown on the Drawings and in accordance with CW2130.

E9.5.7 Shoring Removal

(a) Shoring systems shall be completely removed upon completion of the works.

(b) Care shall be taken to remove the shoring system and backfill the trench in such a way as to not create voids. If the shoring system requires removal after backfill is in place, resulting voids shall be filled with flowable cement slurry.

E9.5.8 Backfill

(a) Backfill within 1.0 m of existing and proposed pavements shall be completed to CW 2030, Class 1 standards. Granular Class 2 backfill shall extend to the underside of the stabilized fill.

(b) Backfilling with frozen materials will not be permitted.

E9.6 Measurement and Payment

E9.6.1 Pipeline Access

(a) Pipeline access shall be paid on a Lump Sum basis for each identified asset at the Contract Unit Price for “Pipeline Access” as listed in the Form B: Prices.

(b) Payment for “Pipeline Access” shall include all costs associated with providing access to the pipeline to accommodate sewer rehabilitation, including but not limited to: excavations, shoring, demolition, manhole modifications, manhole replacement, new manhole installations, backfill, and all other materials, labour, and equipment required to complete the work as specified. Payment will be made on the following schedule:

(i) 50% payment of the Site Access lump sum price for each site or asset will be paid upon commencement of the liner installation for each site.

(ii) 100% payment of the Site Access lump sum price for each site or asset will be paid upon completion and acceptance of backfill and manhole restoration at each site.

(c) All manhole modifications required to facilitate the identified rehabilitation work shall be considered incidental to the pay items identified herein. Additional payment will not be made for manhole modifications required to complete the identified rehabilitation works where site conditions and work requirements are consistent with the tendered scope of work.

E10. SEWER AND MANHOLE REPAIRS AND STABILIZATION

E10.1 Description

(a) Sewer and manhole stabilization shall mean the internal repair of sewers and manholes by man entry techniques. Repairs are varied and may consist of holes in sewers with voids, missing bricks in sewers, obstructions and manhole base or riser repairs. Sewer stabilization repairs shall be carried out in accordance with E10.3, E11, E13, prior to performing sewer lining.

(b) The scope of work involved in sewer stabilization is as follows:

(i) Secure the site and provide temporary traffic control.

(ii) Obtain all necessary underground clearances.

(iii) Conduct a hazard assessment, including identification and evaluation.

(iv) Develop a safe work plan.

(v) Implement the necessary procedures and controls to control hazards and maintain a safe working environment.

(vi) Enter the manhole/sewer and perform the required repairs.

(vii) Clean-up the site.

E10.2 Materials

E10.2.1 Concrete

(a) Concrete for large internal repairs to concrete and brick sewers and manholes and internal void filling shall be in conformance with Table CW 2160.1, Type B.

(b) Patching and grouting of repairs to concrete and brick sewers and manholes shall be with a fast hardening high strength concrete repairing compound designed for underwater use

(i) Approved products: Duro-Crete by C Chemicals or approved equal in accordance with B7.

(c) Flowable cement-stabilized fill for external void filling from the ground surface shall be in conformance with Table CW 2160.1, Type D.

E10.2.2 Manhole components shall conform to CW2130.

E10.3 Sewer Repairs and Preparation Work

E10.3.1 Existing Sewer Design Conditions

(a) The assessment of the liner system design conditions and site-specific repairs required to accommodate lining were based on the conditions observed from sewer inspections that were performed as part of the City of Winnipeg's Sewer Inspection Program. Copies of these video inspections are available to the Contractor upon request by providing a portable hard disk drive (HDD) to the Contract Administrator. The Contract Administrator will copy the inspections onto the HDD and make available to the Contractor for review purposes.

(b) The Contractor shall be aware that the video inspections provided were completed immediately after sewer cleaning and the amount of sediment and debris present at the time of this Bid Opportunity may not be the same. The Contractor shall be responsible to determine the actual amount of sediment and debris in the sewers included in this Work.

(c) For the purposes of this project, including design of the rehabilitation system, the host pipes shall be designated as follows:

(i) Bannatyne Av – Partially Deteriorated
(ii) Bannatyne Av – Fully Deteriorated
(iii) Logan Av – Partially Deteriorated
(iv) Metcalfe Av – Partially Deteriorated
(v) Metcalfe Av – Partially Deteriorated
(vi) St Mary's Road – Partially Deteriorated

E10.3.2 Sewer Cleaning

(a) Cleaning of sewers and manholes shall be completed in accordance with CW 2140 and this Specification.

(b) Further to E10.3.2(a)(a), the following additional cleaning requirements shall apply for the respective rehabilitation technology selected:

(i) For CIPP liners, refer to E12.7.2.
(ii) For GRP liners, refer to E13.7.
(iii) For CCCP/Geopolymer liners, refer to E14.7.2.

E10.3.3 Observed sewer defects and cleaning/preparation works evident in the existing sewer inspection videos have been provided in Appendix A - Host Pipe Conditions.

E10.3.4 Notwithstanding E10.3.1(a), the following sewer stabilization, repairs, and preparation work can be reasonably assumed to be required and shall be completed prior to undertaking the identified rehabilitation work:

(a) General Preparation

(i) Remove loose debris, solid debris, roots, and grease in accordance with CW 2140.
(ii) Remove any remaining organic or biological materials.

(iii) Remove any loose or spalling concrete to a depth sufficient to provide a competent host pipe surface.

(iv) Remove any loose or damaged bricks and/or mortar.

(v) Remove wall encrustations throughout.

(vi) Remove encrustations at service connections.

(vii) Grout sewer services as required following encrustation removal.

(viii) Remove intruding sewer connections in accordance with CW 2140.

(ix) Reshape host sewer pipe invert to the original dimension and cross section at locations where the invert has completely deteriorated.

(b) Further to E10.3.4(a), the following site-specific repairs shall be completed prior to liner installation work:

(i) Site 4: Metcalfe Av (S-MA50004316)

- Temporarily remove all flow level monitoring instrumentation and associated cabling from manhole S-MH50003713, sewer S-MA50004336, and sewer S-MA50004316. The instrumentation cabling is routed along sewer S-MA50004336 at springline to manhole S-MH50003713, and approx. 2.5 meters upstream within sewer S-MA50004316 where it terminates at a flow level monitor at invert. Do not cut existing cabling.
- Prior to removal, make note of existing location and positioning of equipment.
- Upon removal, instrumentation and cabling shall be carefully stored and protected from damage while completing the work.
- Upon completion of lining, reinstall instrumentation matching the original arrangement prior to removal. The level monitoring sensor must be installed within the normal sewer flow, but not touching the invert of the pipe.
- Make any adjustments as required by City of Winnipeg Wastewater Operations during re-commissioning. The Contractor shall assume two return trips to site to adjust the monitoring equipment upon request by the City. Adjustments shall be completed within five (5) days of a request by the Contract Administrator. Additional return trips required due to improperly following City requirements will be completed at the Contractor's expense.

(ii) Site 4: St. Mary's Road (S-MA70003174)

- Remove existing concrete extending across the obvert of the sewer near manhole S-MH50003550 prior to lining.

(c) Further to E10.3.4(a), the following work shall be completed prior to the installation of CIPP liners:

(i) Prepare and fill all voiding, holes, and discontinuities in the host pipe wall greater than 50 mm in depth or 150 mm diameter to provide a reasonably smooth surface against which to install the liner.

(ii) Fill voiding from any missing bricks with a cementitious repair product.

(iii) Repair any sources of infiltration to a level required to successfully complete the liner installation.

(d) Further to E10.3.4(a), the following work shall be completed prior to the installation of grouted liners (GRP):

(i) Hard debris and host pipe features which hamper liner installation shall be removed sufficiently to permit installation of the GRP panels.

(ii) Where Type 1 GRP designs are utilized, the host pipe shall be thoroughly cleaned using water jetting or other acceptable methods prior to lining in accordance with WRc, Sewerage Rehabilitation Manual, Section 9.2.3 to maximize mechanical interlock and bond with the host pipe. The Contractor

shall remove all organic materials, biological slim, roots, soft encrustation, and grease.

(iii) Where Type 1 GRP designs are utilized, all organic materials, biological slim, roots, soft encrustation, and grease shall be removed from the pipe prior to lining.

(iv) Repair any sources of infiltration to a level required to successfully complete the liner and grouting installation.

(v) Any repairs to the host pipe shall be completed with a competent cementitious material compatible with the host pipe, grout, and liner. Repairs shall not compromise the intended structural behaviour or performance of the rehabilitated structure.

(e) Further to E10.3.4(a), the following work shall be completed prior to the installation of CCCP/Geopolymer liners:

(i) Prepare the surface of the host pipe for CCCP/Geopolymer liner installation in accordance with E14.

(ii) Prepare and fill all voiding, holes, missing brick and/or grout, and discontinuities in the host pipe wall greater than 25 mm in depth or 150 mm in diameter to form a competent interior surface consistent with the design assumptions.

(iii) Prepare a smooth grouted transition between any edges or steps in the host pipe wall.

(iv) Repair any sources of infiltration to a level required to successfully complete the liner installation.

(v) Any repairs to the host pipe shall be completed with a competent cementitious material compatible with the host pipe and liner materials. Repairs shall not compromise the intended structural behaviour or performance of the rehabilitated structure.

E10.3.5 The above is the minimum work program required, specific installation requirements for the chosen rehabilitation technology may require additional work beyond what has been specified herein. The Contractor is encouraged to familiarize themselves with the available CCTV data during tendering. Claims for additional costs related to prep work required to complete the installation where conditions are found to be consistent with the tendered condition of the pipeline will not be considered.

E10.4 Manhole Stabilization

E10.4.1 Remove damaged manhole rungs. New manhole rungs are only required to be installed where the existing manhole diameter is greater 1200 mm. Short sections of smaller diameter risers at pavement level, where the main diameter of the MH barrel is 1200 or larger shall have new manhole rungs installed where required. Review with the Contract Administrator on site prior to completing the work.

E10.4.2 The following manhole stabilization repairs shall be completed:

(a) S-MH20014669

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.6 to 1.4 meters below rim.

(b) S-MH20016671

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface

smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.8 to 1.7 meters below rim.

(c) S-MH20016698

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.0 to 0.6 meters below rim.
- 1.5 to 1.9 meters below rim.

(d) S-MH20017058

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.0 to 1.2 meters below rim.

(e) S-MH50006483

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.0 to 3.8 meters below rim.

(f) S-MH50003550

(i) Remove loose and unsound material from inside surface of any cracked or spalling riser sections. Clean and prepare repair area as required and apply concrete patching compound in accordance with the manufacturer's recommendations. Fill all cracks ensuring all gaps are filled. Finish surface smooth and form to shape of wall. Stabilization grouting has been identified at the following locations as a minimum:

- 0.0 to 6.6 meters below rim.

E10.5 Construction Methods

E10.5.1 Equipment Set Up

(a) In accordance with the safe work plan for the repair, the Contractor shall set up the required safety equipment and controls to safely perform the work.

(b) Specialized equipment to perform the repair work, such as lights, pressure washers, drills and chipping hammers shall in no way adversely affect the operation of the safety equipment required to perform the work.

(c) Subsequent to completion of the repairs the Contractor shall remove all equipment form the sewers and manholes.

E10.5.2 Internal Sewer Repairs

(a) The Contractor shall repair the sewer fabric to restore the structural integrity of the sewer and provide a smooth flow surface conforming to the adjacent sewer/manhole cross-section and materials.

(b) Large concrete repairs shall include a reasonable and limited level of surface preparation, including removal of unsound material and cleaning of the edges of the repair area, and setting of the required formwork and bracing. Concrete placement and finishing shall be done in accordance with CW 2160. All formwork and bracing shall be removed from the sewer/manhole at the completion of the work.

(c) Concrete patching shall include a reasonable and limited level of surface preparation, including removal of unsound material and cleaning of the edges of the repair area. The Contractor shall apply the patching material in accordance with the manufacturer's printed instructions.

(d) Small voids in the backfill shall be filled with concrete or other approved material from the inside of the sewer prior to repairing the sewer fabric or by pressure grouting after completion of the repairs. The void shall be completely filled to prevent settlement of the backfill and provide a solid backing for the liner.

(e) Pressure grouting shall be done in accordance with the manufacturer's printed instructions.

(f) Large voids shall be filled from the ground surface after completion of the repairs. Holes shall be cored in the pavement or the pavement shall be saw cut and removed to permit vacuum excavation from the underside of the pavement to the void. The void shall then be completely filled with flowable cement-stabilized fill.

E10.5.3 External Point Repairs

(a) The Contractor shall provide CCTV video of any proposed EPRs for review and acceptance by the Contract Administrator prior to undertaking the work.

(b) Complete external point repairs in accordance with CW2130.

E10.5.4 Sewer Service Grouting

(a) Sewer service grouting prior to lining shall be completed using a non-shrink, watertight cement grout, an appropriate polyurethane grout compound, or other approved grouting product, compatible with the existing host pipe. Grouting shall create a watertight and smooth inner surface for the host pipe and sewer service.

(b) Sewer service grouting post lining shall fill voids between the sewer liner and the host pipe at sewer service openings with an appropriate polyurethane or other grouting system that is compatible with the liner system to form a smooth watertight connection.

E10.5.5 Annulus Grouting for CIPP

(a) Complete annulus grouting where voids are evident between the liner and the host pipe.

(b) Annulus grouting post lining shall be completed using an appropriate cementitious or polyurethane grouting system that is compatible with the liner system.

(c) A cementitious grout shall be used were grouting is required to achieve long term structural performance of the liner and host pipe. In all other applications, a polyurethane grout may be used to fill voids between the liner and host pipe.

(d) Cementitious grout shall conform to the requirements of CW 2130 and CW 2160.

(e) The Contractor shall ensure short term buckling pressures of the installed liner are not exceeded during the grouting process.

(f) A detailed grouting plan shall be submitted for all grouting operations, including the following:

(i) Proposed grouting material complete with physical characteristics.

(ii) Grouting procedure complete with estimated grouting pressures.

(iii) Allowable grouting pressure based on the buckling capacity of the installed liner.

E10.5.6 Manhole Repairs, Modifications, and Installations

(a) Complete manhole repairs, modifications, and new installations identified in the Specifications or on the Drawings in accordance with the drawings and CW 2130.

(b) Manhole rungs removed to facilitate installation of CIPP liner must be replaced with new manhole rungs meeting the requirements of CW 2130.

E10.6 Quality Control

E10.6.1 Repair Acceptance

(a) Upon completion of the designated repair the Contractor shall clean and perform the pre-lining inspection.

(b) The Contractor shall not be responsible for defects in existing un-repaired sewer lines unless those defects are a direct result of the Contractor's operation.

E10.6.2 Correction of Deficiencies

(a) The Contractor shall correct deficiencies found in the sewer repair at their own cost including the cost of re-cleaning and re-inspection to confirm that the deficiencies are rectified in accordance with these specifications.

E10.7 Measurement and Payment

E10.7.1 Sewer Cleaning

(a) Sewer cleaning will be measured and paid in accordance with CW 2140, except as modified herein:

(b) The total length of cleaning to be paid will be the total length of sewer cleaned to the satisfaction of the Contract Administrator.

(i) The maximum length to be paid will be the manhole to manhole sewer length provided by the Contractor.

(ii) Where partial or incomplete cleaning is completed, the length of sewer cleaned will be the length recorded by the Contractors calibrated inspection equipment or as determined by the Contract Administrator.

E10.7.2 Sewer Preparation and Repairs Prior to Lining

(a) Sewer repairs and preparation for lining will be measured on a lump sum basis for each sewer asset and paid for at the Contract Lump Sum price for "Sewer Repairs and Preparation". Work measured for payment shall include repair of pipe wall defects, removal of intruding services, grease, roots, solid debris cutting, and any other materials, equipment, and labour or preparation work required to complete the rehabilitation work.

E10.7.3 Temporary Instrumentation Removal

(a) Temporary removal and reinstallation of instrumentation identified at the downstream end of sewer S-MA50004316 and S-MA50004336 will be paid on a lump sum basis at the Contract Lump Sum price for "Remove & Replace Instrumentation (S-MA50004316 and S-MA50004336)". Payment shall include all materials, equipment, and labour required to complete the work.

(i) 50% payment will be made upon the removal of the instrumentation and cabling.

(ii) 100% payment will be made upon successful reinstallation of the instrumentation, and confirmation of testing and acceptance by the City.

E10.7.4 Annulus Grouting

(a) Annulus voids due to the Contractor's method of lining, deficiencies in the liner installation, or any other reason related to the Contractor's workmanship or method of operations shall be filled at the Contractor's expense.

(b) Repair of defective or incomplete annulus grouting shall be at the Contractors own expense.

E10.7.5 Manhole Modifications

(a) The completion of all manhole and sewer modifications to facilitate pipeline access shall be measured and paid in accordance with E9.6.

E10.7.6 Manhole Stabilization Repairs

(a) Measurement and payment for manhole stabilization repairs will be measured and paid on a lump sum basis at the Contract Lump Sum price for “Manhole Stabilization and Repair” for each respective manhole. Payment will be for all labour, equipment, and materials required to complete the work and restoration as specified.

(b) No payment will be made where manholes are replaced and stabilization works are not completed.

(c) Payment for “Manhole Stabilization and Repair, does not include payment for the replacement of manhole rungs. Payment for the replacement of manhole rungs shall be made in accordance with E10.7.8.

E10.7.7 Provisional - Sewer Service Grouting

(a) Sewer service grouting will be measured on a unit basis and paid for at the Contract Unit Price for “Sewer Service Grouting (900 mm Dia. and greater)”. Number of units to be paid for will be the total number of units reinstated in accordance with this specification, accepted and measured by the Contract Administrator.

(b) If voids at sewer services are due to the Contractor’s method of reinstatement, deficiencies in the liner installation, or any other reason related to the Contractor’s workmanship or method of operations, grouting shall be completed at the Contractor’s expense.

E10.7.8 Provisional – Replacement of Manhole Rungs

(a) Replacement of existing manhole rungs will be measured and paid for in accordance with CW2130. Payment for replacement of existing manhole rungs shall include removal of existing rungs where required.

E11. STRUCTURAL SEWER LINERS

E11.1 Description

E11.1.1 The contractor may choose to use one of the following technologies to rehabilitate each sewer identified in this contract:

(a) CIPP Lining;

(b) Segmental Sliplining with GRP Composites;

(c) CCCP/Geopolymers.

E11.2 Materials and Construction Methods

E11.2.1 CIPP installations shall be completed in accordance with E12.

E11.2.2 Segmental Sliplining using GRP composites shall be completed in accordance with E13.

E11.2.3 CCCP/Geopolymer installation shall be completed in accordance with E14.

E11.3 Measurement and Payment

E11.3.1 Installation of Structural Sewer Liner

(a) Installation of CIPP liners will be measured and paid for in accordance with E12.9.4.

(b) Installation of GRP liners will be measured and paid for in accordance with E13.10.1.

(c) Installation of CCCP/Geopolymer liners will be measured and paid for in accordance with E14.11.1.

E11.3.2 Reinstatement of Sewer Services

(a) Reinstatement of sewer services will be measured on a unit basis and paid for at the Contract Unit Price for “Reinstatement of Sewer Services”. Number of units to be paid for will be the total number of units reinstated in accordance with this specification, accepted and measured by the Contract Administrator.

(b) Payment for sewer service reinstatement will occur after confirmation of sewer service reinstatement via review of the Post-Lining CCTV video. Payment will not be made until the Post-Lining inspection videos have been submitted and reviewed.

E12. CURED-IN-PLACE-PIPE (CIPP)

E12.1 Description

(a) This specification covers the supply and installation of full segment, partial full segment (blind shot), and point repairs using cured-in-place pipe (CIPP).

(b) CIPP lining may be used for both Partially Deteriorated and Fully Deteriorated host pipe conditions.

E12.2 References:

(a) ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials;

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

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

(d) ASTM F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-impregnated Tube;

(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)

E12.3 Definitions

(a) Cured-in-place-pipe (CIPP) means trenchless sewer rehabilitation by installing a resin-felt composite structure which when cured will form a continuous-close fit liner within an existing sewer.

(b) Full segment CIPP means CIPP extending from manhole to manhole or manhole to node (wye or tee connection to another sewer).

(c) Partial full segment CIPP means CIPP extending from a manhole to an intermediate point within the sewer and shall generally be longer than ten metres in length.

(d) Non-Reinforced CIPP liners shall be considered any CIPP liner constructed from a non-reinforced felt.

(e) Reinforced CIPP liners shall be considered any CIPP liner constructed from either a carbon fibre or glass fibre reinforced felt.

E12.4 Submittals

E12.4.1 Installation of CIPP liners shall not commence prior to submission and review of the submissions identified herein by the Contract Administrator.

E12.4.2 Provide CIPP designs for review by the Contract Administrator in accordance with E2 a minimum of ten (10) Business Days prior to manufacturing of the liner.

(a) CIPP thickness computations including all specified design checks identified in E12.5. Identify design assumptions based on a review of the Sewer Maintenance Inspection that differ from the information provided in the Specifications for the existing sewer design conditions. Individual calculations shall be submitted for each liner.

(b) Name and manufacturer of the resin and felt tube proposed for each CIPP.

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

(d) CIPP material properties used for design.

(e) Host pipe measurements identified in E7.2.1, including the following:

(i) Sewer length

(ii) Host pipe dimensions

(iii) Sewer invert depths

(f) Pre-design inspection where specified

(g) Liner sizing. Identify under sizing from the measured circumference and anticipated liner stretch to form a close fit with the host pipe.

(h) Other information that may reasonably be required by the Contract Administrator to confirm the CIPP design proposed conforms to the specified requirements and design intent.

E12.4.3 Provide resin samples within five (5) Business Days of a request by the Contract Administrator. Samples shall be provided as follows:

(a) Arrange for the manufacturer of the resin to forward a reference sample of each type of resin proposed for use on the works to a test laboratory designated by the Contract Administrator to be used as a comparative reference sample for infrared spectrum testing.

(b) When requested by the Contract Administrator, deliver a representative sample from each resin batch to be used on the project before adding the catalyst from the wet-out facility to a test laboratory designated by the Contract Administrator.

(c) The Contract Administrator will arrange and pay for an infrared analysis of the samples, if required for the project.

E12.4.4 Submit a liner impregnation protocol that provides information on the following a minimum of five (5) Business Days prior to wet of out liners:

(a) Resin impregnation method.

(b) Designated location of the wet out facility.

(c) Documentation that the resin to be used has not exceeded its shelf life as recommended by the manufacturer of the resin.

(d) Volume and weight of resin to be impregnated into each liner and repair section including the proposed excess allowance for polymerization and migration (typically 7%) into cracks and joints of the host pipe.

(e) Roller gap setting required to provide the final installed CIPP thickness based on the proposed volume of resin.

(f) Details of the wet-out procedure for internal point repair CIPP.

E12.4.5 Submit a liner installation protocol that provides information on the following a minimum of five (5) Business Days prior to installation of CIPP:

(a) Proposed main line and sewer service flow control arrangements in accordance with E6. Note, flow control plans may be submitted separate from the liner installation protocol.

(b) Installation and curing method complete with proposed equipment.

(c) A full curing protocol, including:

(i) Curing times (heat up, curing, cool down)

(ii) Curing temperatures

(iii) Inversion and cure pressures (minimum and maximum)

(iv) Rate of travel of the UV light train and amount of lamps in operation in the case of UV cures.

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

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

(f) Number and location of thermistors to be used for monitoring the temperature of the liner during the curing process.

(g) Estimated length of time required to reinstate the main line sewer and sewer services.

(h) Submission Requirements:

(i) Tabular installation protocols showing multiple installations are acceptable for all small diameter liners (considered 450 mm in diameter and smaller), provided they meet all other requirements outlined herein.

(ii) Installation protocols for all large diameter sewers (considered greater than 450 mm in diameter) shall be submitted as individual submissions.

E12.4.6 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.

E12.5 Design of CIPP Liners

E12.5.1 Design Objectives

(a) Maximizing the structural enhancement of the sewer by installing a close-fit CIPP.

(b) Maximise the internal diameter of the rehabilitated sewer with as little impact on the hydraulic capacity of the sewer as possible.

(c) Reducing infiltration and exfiltration.

(d) Preventing root intrusion.

(e) Providing sufficient chemical resistance to prevent further sewer pipe degradation related to the conveyance of sewage.

(f) Minimizing sewer service disruption during rehabilitation.

(g) Minimizing the time required to complete the sewer rehabilitation.

(h) Minimizing disturbance to pavements and boulevards.

(i) Minimizing disruption to vehicular and pedestrian traffic.

(j) Minimizing the impact of construction on commercial, industrial, and institutional facilities.

(k) Additional design objectives for internal point repair CIPP include.

(i) Providing a smooth transition between the internal point repair CIPP and the host pipe to prevent the build-up of solids and minimize wear on the repair due to routine sewer cleaning and other maintenance activities.

(ii) Filling any existing voids outside the sewer at the point of repair.

(l) Select a CIPP product and construction approach for rehabilitation with the intent towards maximizing the achievement of these design objectives.

E12.5.2 General

(a) Chemical and mechanical properties of the liner based on the waste stream to establish and minimum design life of 50 years.

(b) Size CIPP in accordance with the design objectives to provide a close-fit to the host pipe with no annulus except for the maximum allowable diametric shrinkage due to curing permitted in ASTM D5813.

(c) Design features of internal point repair CIPP shall include:

(i) Design internal point repair CIPP as a gravity pipe in a fully deteriorated pipe condition and the depth of cover calculated based on the specific location of the repair in the sewer or sewer service.

(ii) Tapered end sections to promote a smooth transition from the repair to the host pipe.

(iii) A means to facilitate flow through by-pass of existing dry weather flow during the course of the repair.

(d) Long-term values for flexural modulus of elasticity and flexural 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 based on an applied stress level of 25% of the yield strength of the liner or equivalent ISO testing. The Contractor shall provide supporting short term and long term test data conforming to ASTM D2990 or equivalent for any resin and felt composites proposed for use on the project.

(e) The Contractor shall also provide short term test data on the modulus of elasticity and flexural strength of the in place composite structure conforming to ASTM D790 for any resin and felt composites proposed for use on the project.

(f) Final internal sewer dimensions (post lining) shall not be less than those identified on the Drawings.

E12.5.3 CIPP Thickness Requirements

(a) The selection of CIPP minimum thicknesses shall be completed in accordance with the appropriate design equations provided in Appendix D. The design equations provide thickness requirements based a range of long-term flexural strength and modulus values for the conditions noted in the design tables.

(b) The Contractor shall determine the required CIPP liner wall thickness using the following procedure:

(i) Select the long-term flexural strength and modulus for the lining product proposed for use.

(ii) Determine the depth and load conditions for the liner.

(iii) Using reviewed and accepted long-term flexural strength and modulus determine the minimum liner thickness from the respective design equation using applicable design conditions.

(iv) The required minimum liner thickness shall be the greater of the thicknesses determined from the design equation for flexural modulus and flexural strength.

(v) Select a nominal CIPP liner thickness greater than the minimum determined through the above method.

(c) Minimum material properties:

(i) Material properties shall conform to the material requirements specified herein and fall within the range of material properties noted in Appendix D.

(d) The Contractor shall confirm the design conditions stipulated with the design equations and advise the Contract Administrator of any conditions more adverse than those identified with the designs. If field conditions are found to be more adverse than those identified with the designs the Contract Administrator (designer) will provide new design curves for the design conditions measured on site. Increases to the liner thickness based on the discovery of more adverse design conditions will be considered a Change in Work as defined by the General Conditions.

E12.5.4 Existing Sewer Design Conditions

(a) The assessment of the liner system design conditions and site-specific repairs required to accommodate lining were based on the conditions observed from sewer inspections that were performed as part of the City of Winnipeg's Sewer Inspection Program. Copies of these video inspections are available to the Contractor upon request by providing a portable hard disk drive (HDD) to the Contract Administrator. The Contract Administrator will copy the inspections onto the HDD and make available to the Contractor for review purposes.

(b) The Contractor shall be aware the video inspections provided were completed immediately after sewer cleaning and the amount of sediment and debris present at the time of this Bid Opportunity may not be the same. The Contractor shall be responsible to determine the actual amount of sediment and debris in the sewers included in this Work.

(c) Observed sewer defects evident in the existing sewer inspection videos have been provided in Appendix A.

(d) The specific design conditions applicable to each CIPP lining location are shown in Appendix B.

(e) Refer to E12.8 for additional site-specific design conditions.

E12.6 Materials

E12.6.1 Non-Reinforced CIPP Products

(a) Non-Reinforced CIPP products shall conform to the requirements of ASTM F1216 and D5813.

E12.6.2 Reinforced CIPP Products

(a) Reinforced CIPP products shall conform to the requirements of ASTM F2019 and D5813. Notwithstanding ASTM F2019, the fabric tube may be reinforced with either glass or carbon fibres, as required to achieve the desired short and long term material properties and may be installed via inversion methods.

E12.7 Construction Methods

E12.7.1 Verification of Existing Sewer Dimensions

(a) Verify dimensional requirements of each sewer to be rehabilitated prior to design and manufacture of the CIPP tube in accordance with E7.2.1.

E12.7.2 Sewer Cleaning

(a) Remove loose debris, solid debris, roots, and grease in accordance with CW 2140 in order to adequately prepare the sewer for lining.

E12.7.3 Sewer Preparation and Repairs Prior to Lining

(a) Perform sewer preparation and repairs as indicated in the Specifications and drawings.

(b) Observed sewer defects evident in the existing sewer inspection videos have been provided in Appendix A – Host Pipe Conditions.

(c) Complete internal host pipe repairs as specified in E10.3 and in accordance with this specification.

(i) Fill in holes and patch deteriorated sections of the host sewer pipe wall.

(ii) Fill voids in the surrounding backfill flush with the inside surface of the sewer pipe.

(iii) Reshape host sewer pipe invert to the original dimension and cross section at locations where the invert has completely deteriorated.

(iv) Remove intruding sewer services in accordance with CW 2140.

(v) Sewer service grouting in accordance with E10.

E12.7.4 Sewer Repairs to be Done by Others

(a) Sewer repairs shown on the Drawings as “To Be Done By Others” or identified prior to sewer lining will be completed before lining work starts.

E12.7.5 Manhole, and Catch Basin Modifications

(a) Perform manhole modifications required to facilitate the liner installation in accordance with E9, E10 and CW 2130.

E12.7.6 Continuous Temperature Monitoring

(a) Where specified, the Contractor shall install the CIPP liners complete with a fibre optic thermal sensing cable (to be left in place) that is capable of continuously monitor curing temperatures along the entire length of CIPP liner. The cable and recording equipment shall be capable of temperature readings every 450 mm in real time. Curing data logs shall be submitted to the Contract Administrator with the Quality Control records.

(b) Continuous temperature monitoring shall be utilized on the following installations:

(i) Air/steam installations 900 mm and greater in diameter (or internal height);

(ii) water installations 1200 mm and greater in diameter (or internal height); and/or

(iii) as specified in E12.8 and/or on the drawings.

E12.7.7 Installation of CIPP

(a) Install liners by inversion methods in accordance with ASTM F1216 or by pull-in methods in accordance with ASTM F1743 or ASTM F2019.

(b) Full segment and partial full segment CIPP shall be cured by hot water, steam, or UV light sources.

(c) Carry out workmanship in accordance with ASTM D5813.

(d) Trim ends of CIPP neatly to fit flush with interior vertical surface and manhole benching and seal to make watertight.

(e) Fill annular spaces where the CIPP does not make an adequate seal with the host pipe at manholes, termination points and sewer services due to broken or misaligned pipe with a resin-rich mixture compatible with the CIPP.

(f) Extend limits for internal point repairs a minimum of 300 millimetres in each direction beyond the limits of the defect to be repaired. Extend internal point repairs that terminate at sewer service services a minimum distance of 300 millimetres beyond the limit of the service.

(g) Ensure termination points of internal point repairs provide a smooth and uniform flow transition to the host pipe for the full circumference of the repair.

(h) Transitions to the host pipe shall be tapered. Where liner thickness is greater than 25 mm, transitions shall be constructed in accordance with E13.8.3 using materials meeting the requirements of E13.5.3.

(i) Refer to E12.8 for additional site specific installation conditions.

E12.7.8 Reinstatement of Sewer Services

(a) Reinstate all active and unable to determine sewer services including CB leads and utility drains to 100% of the original cross sectional area.

(b) Cut out openings for sewer services from inside the lined sewer by manual means or with a television camera and a remote controlled cutting device.

(c) Remove sharp edges from opening cut outs and provide a smooth rounded lip.

(d) Sewer Service Grouting

(i) Locations for sewer service grouting shall be identified by the Contract Administrator during review of Post Lining Video Inspection.

(ii) Complete sewer service grouting in accordance with E10.

(e) The Contractor is responsible for ensuring that all cut-outs for sewer connections are removed from the sewer and are prevented from being washed into the sewer system downstream of the repair location. Costs associated with damage to downstream pump stations, and the time expended to clear blockages, will be charged back to the Contractor.

E12.7.9 Transitions

(a) Transitions to the host pipe are required where CIPP liner thicknesses are greater than 25 mm. Construct transitions in accordance with the Drawings and E13.8.3 using materials compatible with the liner or meeting the requirements of E13.5.3.

E12.7.10 Shaft Closures

(a) At mid pipe access shafts where the CIPP liner cannot practically provide a fully restored sewer invert and obvert the Contractor shall restore the existing host pipe as follows:

(i) Restore the invert up to the interface with CIPP closure using an approved cementitious repair product in accordance with E13.5.3.

(ii) Invert restoration shall be completed in accordance with the product manufacturer's recommendations with flow control measures in place and shall be permitted to cure sufficiently prior to exposure to sewage. The closure shall be constructed to a thickness equaling the thickness of the liner. The closure shall not result in a low spot or sump within the sewer.

(iii) Provide a smooth and level transition from liner to the closure location.

(b) The obvert of the host pipe shall be restored with a cast in place concrete closure as shown on the Drawings and in accordance with E8. The cast-in-place concrete closure shall be formed from within the sewer to provide a smooth and level transition from the new liner.

E12.7.11 Annulus Grouting

(a) Complete annulus grouting in accordance with E10 where identified by the Contract Administrator during the Post Lining Video inspection.

E12.7.12 Styrene Management

(a) Under no circumstances shall cure water or condensate containing styrene be discharged into a storm sewer or any other direct connection to surficial drainage courses or facilities.

(b) The Contractor shall develop and implement a styrene management plan for each site that could reasonably be impacted by planned or inadvertent discharge of styrene into the environment via overflows or the land drainage system, based on the site specific conditions for the CIPP installation and boundary conditions at that site.

(c) The Contractor shall submit styrene management plan(s) for each identified site at the request of the Contract Administrator, or a minimum of five (5) days prior to lining.

(d) The Contractor's styrene management plan shall include one or more of the following methods of control:

(i) Use of styrene free resins;

(ii) Use of on-site treatment systems where hot water curing methods are utilized;

(iii) 100% condensate capture and off-site disposal to the WWS system;

(iv) On-site monitoring to verify no residual styrene is discharged to the environment where UV curing methods are used.

(e) All styrene management plans shall include sufficient details on:

(i) Regulatory compliance considerations for discharge based on the Contractor's proposed resin selection, curing method, and discharge location for steam condensate or cure water, first flush, etc.

(ii) The means, methods, and techniques employed to mitigate styrene levels to within acceptable limits for the site specific application, including:

- Resin selection to eliminate or mitigate styrene levels;
- Cure considerations to mitigate excessive styrene volatilization;
- Handling considerations, post cure to mitigate levels discharged to aquatic or other environments that may be deleteriously impacted by excessive styrene levels.

(f) The Contractor shall be responsible to undertake sufficient monitoring to confirm and demonstrate that discharge levels are consistent with the styrene management plan's stated discharge limit objectives. Provide a report on styrene monitoring results upon completion of liner installation.

E12.7.13 Quality Control Records

(a) Maintain the following Quality Control records of the work and provide to the Contract Administrator after completion of the work.

(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.
- Roller gap setting.
- 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.

(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 sewer and measured liner elongation.

(v) Continuous log of temperature at boiler in and out and at all thermistors placed between the host pipe and the liner at all manholes during the initial cure, cure, and cool down periods.

(vi) For UV cures, monitoring shall also include the rate of travel of the UV assembly and the amount of lamps in operation during the curing process.

(vii) Continuous temperature monitoring logs.

E12.7.14 CIPP Samples for Quality Assurance Purposes

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

(i) Confined test sample in accordance with E12.7.14(j).

(ii) Plate sample in accordance with E12.7.14(k).

(b) The Contract Administrator will be arranging for testing of obtained samples for flexural mechanical properties in accordance with ASTM D790.

(c) If it can be demonstrated that it is impractical to obtain confined test samples due to CIPP size and/or site specific conditions then results from test plate sample results modified in accordance with Clause E12.7.14(k)(vi) of this specification will be used to confirm flexural strength and flexural modulus.

(d) Schedule the installation of liners for which confined pipe samples are impractical to obtain after a minimum of three (3) previous CIPP linings on the same project have been completed and confined pipe and test plate samples have been secured to provide collaborative testing. The Contract Administrator will coordinate and pay for CIPP sample testing to confirm the CIPP flexural strength, flexural modulus and thickness in accordance with the requirements of ASTM D5813, D790, and ASTM D3567.

(e) Where plate sample testing results are used for design reconciliation purposes they will be reduced by the statistical difference between plate and pipe sample testing results on the project as described in E12.7.14(d). Where no statistical correlation can be found due to poor testing results or lack of comparison samples a 15% reduction will be applied to both flexural strength and modulus results obtained from plate sample testing.

(f) In larger sewer sizes where it is not possible to provide a full diameter confined test sample the Contractor shall, upon the request of the Contract Administrator, cut a sample directly from the installed CIPP liner in accordance with E12.7.14(k)(vi).

(g) Where confined test samples cannot be obtained or where confined test samples forms do not match the inside dimensions of the host pipe the Contractor shall obtain and provide the Contract Administrator with pre and post lining measurements taken in accordance with Clause E7.2.1 of this specification to confirm in-place liner thickness. For sewers greater than 450 mm in diameter, the contractor shall core four (4) 50 mm diameter holes in the CIPP liner at a location representative of the CIPP liner as a whole, typically a minimum of 200 mm into the host sewer. Cores shall be taken at the 12, 3, 6, and 9 o'clock positions. The clock position and sewer asset number shall be labelled on the samples and the samples provided to Contract Administrator in a labelled plastic bag. Coring shall open occur in the presence of the Contract Administrator. The core samples will be submitted to the QA testing agency for thickness measurements. Core holes shall be repaired in accordance with E12.7.14(l)(v).

(h) The Contract Administrator will review CIPP liner thickness results taken from test plates or unconfined samples on a case-by-case basis.

(i) All samples shall be labeled as follows:

(i) City of Winnipeg asset number

(ii) Date of installation

(iii) Street name

(j) 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) Locate the test sample from inside an intermediate manhole or at a termination point and invert through the form.

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

(iv) 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.

- Identify the sewer where the liner sample is from on the form or sample itself if no form and provide to the Contract Administrator intact in the form.

(k) Test Plate Samples

(i) Produce and provide to the Contract Administrator test plate samples of each CIPP liner installed.

(ii) 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.

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

(iv) 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

(v) 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.

(vi) Flexural strength and flexural modulus results obtained from test plates will be reduced, if necessary, as identified above.

(l) Direct Cut Samples

(i) Where directed, the Contractor shall obtain a sample of the installed CIPP liner from within the host pipe.

(ii) Direct samples of the CIPP liner shall be a minimum of 300mm x 300mm for unreinforced liners.

(iii) For reinforced liners the 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 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 obtaining the sample.

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

(iv) Cut the test sample from a location where no defects were noted in Appendix A and at the 10:00 o'clock or 2:00 o'clock position in circular sewers. Direct samples from reinforced liners shall be oriented with the long dimension vertically in the straightest portion of the sewer or as directed by the Contract Administrator. For non-circular sewers this may be located in a lower quadrant of the sewer. Confirm sampling locations with the Contract Administrator prior to work.

(v) Grout the area where test sample was taken with a resin-rich repair product such as an epoxy based repair system that is compatible with the liner system and specifically designed for the nature, size and thickness of the patch being repaired to form a smooth watertight patch flush with liner.

- For CIPP liners 25 mm in thickness and greater a polymer modified cementitious grout compatible with the liner materials may be used.

(vi) Ensure repairs at direct sampling locations are captured during subsequent CCTV inspections.

E12.7.15 Infrared Spectroscopy

(a) The Contract Administrator may arrange for testing 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 at no cost to the Contractor.

E12.7.16 Post Construction Design Review for Total Performance

(a) The Contract Administrator will perform a post-construction design review to confirm that the completed CIPP meets the 50 year design life structural requirements prior to issuance of Total Performance. The design review will utilize the measured values for flexural strength, flexural modulus, and CIPP thickness from the confined pipe sample testing, directly obtained samples, or the reduced strength/modulus values obtained from the test plate testing in circumstances where confined pipe samples are not able to be secured.

(b) CIPP strength values will be further reduced to account for creep based on the creep reduction values identified during the CIPP design process to assess the suitability of the liner to meet the 50 year design life requirement. 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 sewer inspection.

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

(i) Deficiencies in the physical testing results for CIPP liners will be reviewed by the Contract Administrator. The Contract Administrator will undertake efforts to reconcile the design based on the physical test results for the deficient liner, and accounting for the verified condition of the host pipe prior to lining, the CIPP installation conditions, and the long-term use of the sewer to assess whether the installed CIPP meets the specified design objective.

(ii) Defects in CIPP liners will be reviewed on a case by case basis by the Contract Administrator. The Contract Administrator will consult with the Contractor and taking into account the condition of the host pipe prior to lining, the CIPP installation conditions, and the long term use of the sewer to assess the structural and performance ramifications of the defects.

(d) The Contractor shall:

(i) Perform necessary remedial measures to confirm that a CIPP deemed as structurally deficient will comply with the 50 year design life requirement such as confirmation of actual ovality, determination of a more representative groundwater elevation locally through monitoring, and supplemental strength testing and thickness measurements.

(ii) Repair sections of CIPP removed for supplemental testing by placing a full circumference internal point repair of the same thickness as the full segment liner over and extending 300 millimetres beyond each side of the cut section.

(iii) Install a supplemental CIPP of the required thickness to structurally enhance the installed CIPP if supplemental testing fails to confirm the CIPP will meet the 50 year design life requirement.

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

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

E12.8 Site Specific Design and Installation Considerations

E12.8.1 Blind Shots

(a) The following assets have been identified as terminating directly into the downstream sewer:

(i) N/A

E12.8.2 Storm Sewers

(a) The following assets have been identified as land drainage sewers. The Contractor shall employ styrene management methods in accordance with E12.7.12.

(i) N/A

E12.9 Measurement and Payment

E12.9.1 Verification of Existing Sewer and CIPP Dimensions

(a) Verification of existing sewer and CIPP dimensions will be considered incidental to the Work and will not be measured for payment. No separate payment will be made.

E12.9.2 Sewer Cleaning

(a) Sewer cleaning will be measured and paid for in accordance with E10.7.1.

E12.9.3 Sewer Preparation and Repairs Prior to Lining

(a) Sewer repairs and preparation for lining will be measured and paid for in accordance with E10.7.2.

E12.9.4 CIPP Installation

(a) Liner installation will be measured on a length basis for each size and/or individual asset, and paid for at the Contract Unit Price for “Supply and Installation of Structural Sewer Liner”. Length to be paid for will be the total length of CIPP supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(b) Full segment CIPP measurement will be made horizontally at grade, above the centreline of the pipe from centre to centre of manholes.

(c) Partial segment CIPP measurement will be made from the centre of one manhole to the termination point of the CIPP as measured by the post lining video inspection. Partial full segment CIPP installed beyond the limits identified by the Contract Administrator during review of the pre-lining video will not be measured for payment.

(d) CIPP point repairs will be measured by the post lining video inspection. CIPP point repairs installed beyond the limits identified by the Contract Administrator during review of the pre-lining video shall not be measured for payment.

(e) 80% payment will be made upon satisfactory completion of the CIPP installation work.

(f) 100% payment will be made upon confirmation of the CIPP strength, delivery and acceptance of all required submissions, shop drawings, and reports, and rectification of all identified defects.

(g) Payment for the supply and installation of CIPP liners shall include but is not limited to the following:

(i) Verification of existing sewer dimensions;
(ii) All specified submittals;
(iii) Supply and installation of CIPP liners;
(iv) Transitions at liner terminations;
(v) Provision of test samples;
(vi) Quality control testing and records;
(vii) Rectification of identified defects; and,
(viii) Any other materials and labour specified herein.

(h) Where CIPP liners are improperly installed due to negligence on the part of the Contractor, payment for the CIPP liner will be withheld until the identified issues have been rectified.

E12.9.5 Reinstatement of Sewer Services

(a) Reinstatement of sewer services will be measured and paid for in accordance with E11.3.2.

E12.9.6 Sewer Service and Annulus Grouting

(a) Sewer service and annulus grouting will be measured and paid for in accordance with E10 for the type of work done.

E12.9.7 Quality Control Records

(a) Preparation of quality control records will be considered incidental to "Supply and Installation of Structural Sewer Liner" and will not be measured for payment. No separate payment shall be made.

E12.9.8 Quality Control Sampling

(a) All work and materials required for the preparation, recovery, and repair of samples and liners for the purposes of quality control testing as specified herein shall be considered incidental to "Supply and Installation of Structural Sewer Liner" and will not be measured for payment. No separate payment shall be made.

E12.9.9 Test Samples

(a) All work and materials required for the preparation, recovery, and repair of CIPP test samples will be considered incidental to "Supply and Installation of Structural Sewer Liner" and will not be measured for payment. No separate payment shall be made.

E12.9.10 Styrene Management

(a) All work and materials required for the management of styrene will be considered incidental to "Supply and Installation of Structural Sewer Liner" and will not be measured for payment. No separate payment shall be made.

E12.9.11 Continuous Temperature Monitoring

(a) All work and materials required for the supply, installation, operation, and reporting of continuous temperature monitoring equipment and results will be considered incidental to "Supply and Installation of Structural Sewer Liner" and will not be measured for payment. No separate payment shall be made.

E13. SEGMENTAL SLIPLINING WITH GRP COMPOSITES

E13.1 Description

(a) This Specification shall govern the supply and installation of GRP composite panels via segmental sliplining.

(b) GRP sliplining may be used for both Partially Deteriorated and Fully Deteriorated host pipe conditions.

E13.2 References:

(a) WRc Sewerage Rehabilitation Manual, 4th Edition;

(b) IGN 4-34-02 – Specification for Glassfibre Reinforced Plastics (GRP) Sewer Linings;

(c) ACI 229 – Report on Controlled Low-Strength Materials; and,

(d) CSA A23.2 – Test Methods and Standard Practices for Concrete.

E13.3 Submittals

E13.3.1 Installation of GRP panels shall not commence prior to submission and review of the submissions identified herein by the Contract Administrator.

E13.3.2 Provide GRP liner designs for review by the Contract Administrator in accordance with E2 a minimum of five (5) Business Days prior to manufacturing of the GRP panels. GRP liner shop drawings shall include the following information:

(a) GRP panel thickness computations including all specified design checks identified in E13.4. Identify design assumptions based on a review of the Sewer Maintenance Inspection that differ from the information provided in the Specifications for the

existing sewer design conditions. Design submissions shall include all calculations and shall be submitted on individual calculation sheets for each liner;

(b) Name and manufacturer of the GRP panels;

(c) GRP material properties used for design. Include all relevant testing information stipulated herein to confirm long term material properties used in design;

(d) Grout mix design and relevant constituent properties for the grout mixture;

(e) Pipe joint assembly requirements;

(f) Panel blocking arrangement as it relates to short term buckling design checks;

(g) Short term buckling checks for grouting operations;

(h) Host pipe measurements identified in E7.2.1, including the following:

(i) Sewer length;

(ii) Host pipe dimensions; and,

(iii) Sewer invert depths.

(i) Pre-design inspections were specified

(j) Shop drawings for the GRP panels showing dimensions, joint details, finished surface profiles, and any other information required to permit review of the design

(k) Other information that may reasonably be required by the Contract Administrator to confirm the CIPP design proposed conforms to the specified requirements and design intent.

E13.3.3 For Type 1 designs, submit demonstration shear bond testing results in accordance with E2 a minimum of five (5) Business Days prior to commencement of lining work.

(a) The testing report shall be submitted in accordance with IGN-4-34-02.

E13.3.4 Submit a construction protocol in accordance with E2 a minimum of ten (10) Business Days prior to commencement of lining work. The construction protocol shall include the following:

(a) Proposed main line and sewer service flow control arrangements in accordance with E6. Note, flow control plans may be submitted separate from the liner installation protocol.

(b) Pipe assembly details including joint assembly method, liner placement methods, and blocking arrangements;

(c) Required pipe assembly materials (joint adhesives and sealants);

(d) Bulkhead construction for grouting;

(e) Construction methods for tapered transitions; and,

(f) Detailed implementation schedule for panel assembly, annulus grouting, service reinstatement, and terminations.

E13.3.5 Submit a grouting protocol in accordance with E2 a minimum of five (5) Business Days prior to commencement of liner installation. The grouting protocol shall include the following:

(a) Grout sample testing results in accordance with E13.6.1.

(b) Minimum and maximum grouting pressures as confirmed by submitted design calculations;

(c) maximum allowable liner deflection/deformation as confirmed by submitted design calculations;

(d) quality assurance and quality control program to verify grout physical characteristics;

(e) grout supplier;

(f) grouting equipment; and,

(g) grouting procedures, including injection points, grout lift heights, means of confirming grout placement and complete filling of the annular space.

E13.4 GRP Liner Design

E13.4.1 Design Objectives

(a) Maximizing the structural enhancement of the sewer by installing a structural section of sufficient quality and sufficient strength to address all relevant loading conditions and preclude further sewer deterioration.

(b) Minimizing the hydraulic capacity impact of rehabilitation by maximizing the bore of the rehabilitated sewer.

(c) Reducing infiltration and exfiltration that may compromise long term structural stability of the pipe.

(d) Preventing root intrusion.

(e) Providing sufficient chemical resistance to prevent sewer pipe degradation related to the conveyance of storm water or sewage.

(f) Minimizing sewer service disruption during the rehabilitation process.

(g) Minimizing the time required to complete the sewer rehabilitation.

(h) Minimizing disturbance to pavements and boulevards.

(i) Minimizing disruption to vehicular and pedestrian traffic.

(j) Minimizing the impact of construction on commercial, industrial, and institutional facilities.

E13.4.2 General

(a) Utilize materials with chemical and mechanical properties that are capable of providing a minimum design life of 50 years based on the waste stream present.

(b) Long-term values 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 product based on an applied stress level of 25% of the yield strength of the liner. Verified long and short term values for flexural modulus, long term flexural strain (measured in the hoop direction), long term tensile strength, and shear bond strength, all tested in accordance with IGN-4-34-02 or ASTM/ISO equivalent. The Contractor shall provide supporting short and long term test data.

(c) Size GRP Segments in accordance with the design objectives to minimize annulus size and to maximise hydraulic capacity; with due consideration to meet reasonable constructability considerations.

(d) Final internal sewer dimensions shall not be less than those identified on the Drawings and herein.

E13.4.3 GRP Liner Thickness Requirements

(a) The selection of GRP liner minimum thicknesses shall be completed in accordance with the appropriate design equations provided in Appendix D. The design equations provide thickness requirements based a range of long-term flexural strength and modulus values for the conditions noted in the design tables.

(b) The Contractor may utilize the WRc Type 2 Design curves for all sewer sections and has the option of utilizing a WRc Type 1 Design for S-MA20018612.

(c) The Contractor shall determine the required liner wall thickness using the following procedure:

(i) Use the reviewed and accepted long-term flexural strength and modulus for the lining product proposed for use.

(ii) Determine the depth and load conditions for the liner.

(iii) Using the long-term flexural strength and modulus determine the minimum liner thickness from the respective design equation using applicable design conditions.

(iv) The required minimum liner thickness shall be the greater of the thicknesses determined from the design equation for flexural modulus and flexural strength.

(v) Select a nominal liner thickness greater than the minimum determined through the above method.

(d) Minimum material properties:

(i) Material properties shall conform to the material requirements specified herein and fall within the range of material properties noted in Appendix D.

(ii) For Type 1 Designs:

- Minimum shear bond between the grout and exterior of the liner shall be 0.68 MPa.
- Minimum long-term tensile strength: 10 MPa

(e) The minimum liner thicknesses included herein relate to long term loading conditions only and have not considered short term installation loads. The Contractor is responsible for confirming the structural stability of the GRP liner under the proposed grouting scheme.

(f) The Contractor shall confirm the design conditions stipulated with the design equations and advise the Contract Administrator of any conditions more adverse than those identified with the designs. I field conditions are found to be more adverse than those identified with the designs the Contract Administrator (designer) will provide new design curves for the design conditions measured on site. Increases to the liner thickness based on the discovery of more adverse design conditions will be considered a Change in Work as defined by the General Conditions.

E13.4.4 Minimum Final Sewer Dimensions

(a) The Contractor shall ensure the GRP liner has internal dimensions equal to or greater than the following:

(i) S-MA20016321 – 1309 mm

(ii) S-MA20018612 – 1296 x 796 mm

(iii) S-MA20019010 – 1305 x 805 mm

(iv) S-MA50004336 - 1487 x 887 mm

(v) S-MA50004316 – 1487 x 887 mm

(vi) S-MA50004315 – 1487 x 887 mm

(vii) S-MA70003174 – 1487 x 887 mm

E13.5 Materials

E13.5.1 GRP Composite Liner Product

(a) Constituent materials and manufacturing of GRP segments shall conform to IGN 4-34-02.

(b) Joints:

(i) Joints shall meet the requirements of IGN 4-34-02, Section 7.

(ii) Joints shall be capable of withstanding internal and external hydrostatic pressures. Assume both internal and external water levels at ground surface for the purposes of joint hydrostatic integrity.

(iii) Longitudinal joints shall be rigid and assembled using a structural adhesive permitting full transference of tensile forces.

(c) Appearance Criteria

(i) Each GRP panel shall be reviewed relative to Table 3 of Appendix G of IGN 4-34-02 for confirmation that all external and internal surfaces are within final allowable defect limits.

(d) GRP Liners shall meet the greater of the Performance Requirements noted in Table 1 of Section 8 of IGN No. 4-34-02 or the project specific design requirements. The manufacturer shall demonstrate type testing results to confirm conformance with both the IGN specification and production run testing. Type testing shall be required for confirmation of all short and long term properties in Table 1 (Section 9, Clauses 9.2, 9.3, 9.4, 9.5, and 9.6), while production run tests are also required to substantiate short term properties for short term flexural modulus and strength.

(e) Shear bond testing shall be carried out on production run pipe samples in accordance with E13.6.2. The Contractor shall provide a minimum of ten (10) 150 x 150 mm samples of the liner meeting the requirements of IGN No. 4-34-02, clause D3.2 for the purposes of completing the shear bond testing. Any samples not used for the initial shear bond testing shall be available for casting shear bond samples on site in accordance with E13.6.2(e).

(f) Approved Manufacturers:

(i) Channeline International;

(ii) Hobas Pipe;

(iii) Flowtite; or,

(iv) approved equal in accordance with B7.

E13.5.2 Annular Grout

(a) The proposed annular grout shall have material properties that permit grouting to occur without voiding within the annulus and has sufficient mechanical properties to achieve the desired structural intent where Type 1 liners are proposed.

(b) Grouts shall conform to the requirements of ACI 229.

(c) Grout parameters and mechanical properties shall be provided through demonstration testing in accordance with E13.6.1.

E13.5.3 Transitions

(a) Transitions shall be completed using a polymer concrete grout compatible with the liner and grouting materials.

(b) Approved products:

(i) Sikatop 123 as manufactured by Sika Canada Inc., or

(ii) approved equal in accordance with B7.

E13.6 Quality Control/Quality Assurance (Qc/Qa) and Testing

E13.6.1 Quality control for cementitious grouting materials shall conform to CSA A23.2, expect as modified herein:

(a) Confirm the viscosity of the grout mixture in accordance with CSA A23.2, Test Method 1B to ensure conformance with the submitted grouting plan and shear bond tests. Flow properties of grout shall be checked a minimum of once per production run, for every 25 m3, or once per 30 minutes, whichever is more frequent.

(b) Confirm the density of the grout mixture in accordance with CSA A23.2, Test Method 6C. Grout density shall be measured and recorded once per production run, for every 25 m3, or once per 30 minutes, whichever is more frequent. The density shall be maintained within +/- 10 % of the design density.

(c) Prepare and test quality control samples for compressive strength and density in accordance with CSA A23.2, Test Method 1B. Prepare a minimum of two (2) test cubes for each production run, or every 25 m3, whichever is more frequent. The Contractor shall arrange to have test cubes tested at an approved testing facility in accordance with CSA A23.2, Test Method 1B.

E13.6.2 Shear Bond Testing

(a) Shear bond testing for Type I liner designs shall be undertaken in accordance with Appendix D of IGN-4-34-02. Shear bond testing is only required for Type I GRP liner

designs. Intent of shear bond testing is to verify the shear bond values used in the GRP liner design.

(b) One set of shear bond testing as per Clause D.3.2 of IGN No. 4-34-02 for each combination of grout and liner product.

(c) Test samples shall be cast with the same grout mix and constituent materials as those proposed in the grouting submission. The grout mixture used for the shear bond testing shall be tested in accordance with E13.6.1 and results included in the shear bond testing report.

(d) A shear bond testing report shall be prepared and submitted to the Contract Administrator in accordance with E13.3.3.

(e) Where inconsistences are present with the proposed grout, the grout used for the shear bond testing, or the quality control tests completed in the field the Contract Administrator may require shear bond samples to be cast during the grouting operation or cores taken for the purposes of shear bond testing.

(f) Accepted Testing Facilities:

(i) University of Waterloo, Center for Advancement of Trenchless Technologies. Testing to be completed under the direction of Dr. Mark Knight (1-519-888-4567 Ext:36919) or approved alternative testing facility in accordance with B7.

E13.6.3 Quality Control Records

(a) Maintain the following Quality Control records of the work and provide to the Contract Administrator after completion of the work.

(i) Summary of the GRP Segment manufacturing records, including:

- All QA/QC testing carried out in accordance with IGN 4-34-02; and,
- A certificate of compliance in accordance with Appendix H of IGN 4-34-02 for each GRP liner design.

(ii) A grouting summary including all QA testing reports identified herein; and,

(iii) Results of any additional shear bond testing in accordance with E13.6.2.

E13.7 Sewer Preparation

E13.7.1 Sewers shall be prepared for lining in accordance with E10.3.

E13.7.2 The following are required for Type I rehabilitation system where grout bond with the host pipe is required:

(a) The host pipe shall be thoroughly cleaned using water jetting or other acceptable methods prior to lining in accordance with WRc, Sewerage Rehabilitation Manual, Section 9.2.3. The host pipe shall be free of organic materials, biological slim, roots, soft encrustation, and grease which may inhibit bonding to the host pipe; and,

(b) Any repairs to the host pipe shall be completed with a competent cementitious material compatible with the host pipe, grout, and liner. Repairs shall not compromise the intended structural behaviour or performance of the rehabilitated structure.

E13.7.3 Infiltration shall be stopped or reduced to the level required to successfully complete the grouting operations.

E13.8 Installation of GRP Liners

E13.8.1 GRP Panel Installation.

(a) Assemble GRP panels in accordance with approved installation protocol submission.

(b) Profile of alignment shall be offset to invert of pipe to as great a degree as possible leaving largest annulus at crown.

(c) Securely fasten panels in-place to facilitate construction and sufficiently to assure that panels are not displaced during grouting operations. Ensure that temporary support

system minimizes point loads and other features that may cause damage to GRP liner during grouting operations.

(d) The contractor shall take every effort to prevent the accumulation of debris and sewage between the liner and the host pipe. Sewer services shall not be permitted to discharge into the annulus at any time.

E13.8.2 Annulus Grouting

(a) Where a Type I rehabilitation system is proposed, all debris and contaminates between the liner and the host pipe shall be removed via flushing or other acceptable methods prior to grouting.

(b) Carry out annulus grouting in accordance with approved grouting protocol submission. Monitor the liner during grouting operations to ensure short-term deflections do not exceed the allowable maximums and that the liner is not displaced during grouting operations.

(c) The Contractor is responsible for confirming that annulus is fully grouted.

(d) Temporary wooden plugs may be used to plug grouting ports during grouting. Upon completion, the holes shall be repaired using a resin-rich repair product such as an epoxy based repair system that is compatible with the liner system and specifically designed for the nature, size and thickness of the patch being repaired to form a smooth watertight patch flush with liner.

(e) General grouting requirements:

(i) Estimate the volume of grout required, including an overfill allowance based on grout properties, sewer geometry and condition, and previous experience with grout mixture;

(ii) By-pass or pump through any sewer flows that occur during grouting operations;

(iii) Minimize infiltration (or its effects) to the extent required to successfully complete the grouting operations;

(iv) Inject from the downstream end of the renovated section;

(v) Inject from the invert towards the crown;

(vi) Provide air vents at the high points;

(vii) Monitor and record the injection pressures;

(viii) Inspect the lining for signs of distortion or flotation;

(ix) Monitor and record the volume of grout injected and compare with the estimate (with due consideration of an overfill allowance); and,

(x) Regularly monitor for grout leaks in sections of sewer upstream and downstream, drain connections (via inspection chambers), particularly if the volume of grout injected exceeds the estimated grout take.

(f) The volume to be grouted at any one time can be varied to suit the various constraints such as the workability of the grout, design of the lining (including flotation), capacity of the mixing and pumping equipment, rate of installation of the lining, and the necessity for over pumping.

(g) Grout should either be injected through a minimum of three preformed holes (nominally 50 mm diameter) located in the haunches and crown of the lining or through pipes cast into the crown and invert of the stop ends. The former method is preferable because, in the event of a blockage, grouting can recommence at the adjacent panel. The grout should be injected from the lowest vent hole and successive holes plugged as air free grout is seen to issue from them. If the major dimension of the lining exceeds 1000 mm consideration should be given to the provision of more grout holes.

(h) Bulkheads:

(i) Bulkheads shall be constructed at the termination of the liner to facilitate lining and shall be temporary or permanent in nature.

(ii) If permanent, the bulkhead shall be constructed from cementitious materials consistent with the design of the rehabilitation system and the liner termination transitions.

(iii) Bulkheads shall include ports, located at regular intervals around the circumference of the host pipe for the purposes of confirming complete grouting of the annulus. Ports shall be located at the following minimum locations:

- 4 and 8 o'clock position (max of 0.5 m above invert)
- Springline of the host pipe
- 2 and 10 o'clock position
- Crown of the host pipe

(iv) Grout inspection ports shall be removed upon completion of the lining works and adequately plugged using fittings compatible with the port (HDPE or PVC) or a suitable cementitious product. Construction of the liner termination transition shall completely envelope the grout inspection ports such that no portion of the ports is visible upon completion of the work.

E13.8.3 Transitions at Liner Termination

(a) At transition terminations, the interface between the exterior surface of the liner and the host pipe shall be made watertight. The transition shall extend a minimum of 1.00 m into the host pipe from the end of the liner (unless otherwise shown on the Drawings) and provide a gradual transition from the host pipe to the lined section. Grouted transition shall match the GRP liner internal diameter and taper to a thickness of no more than 13 mm where meeting the host pipe.

(b) Preparation of the host pipe and installation of the approved cementitious grouting product shall follow the manufacturer's recommendations.

(c) Transitions shall be constructed while flow bypass arrangements are in place and shall be permitted to cure sufficiently prior to exposure to sewage.

E13.8.4 Reinstatement of Sewer Connections

(a) Reinstate sewer connections in a watertight manner that precludes leakage or infiltration at the connection between the host pipe and the liner.

(b) Reinstate live sewer connections to 100% of the original cross sectional area.

(c) Remove sharp edges from opening cut outs and provide a smooth rounded lip.

(d) Sewer service connections shall be terminated flush with the interior surface of the lined sewer.

(e) Sewer Service Grouting

(i) Fill voids between the liner and the host pipe at sewer service openings with a non-shrink, watertight cementitious or resin rich grout compatible with the liner system, or other approved grouting product to form a smooth watertight connection.

E13.8.5 GRP Closures

(a) GRP closures shall be constructed from full segment GRP panels and shall result in a uniform interior surface.

(b) The obvert of the host pipe shall be restored with a cast in place concrete closure as shown on the Drawings and in accordance with E8. The cast-in-place concrete closure shall be cast directly against the new GRP liner panel.

E13.9 Post Construction Design Review for Total Performance

(a) The Contract Administrator will perform a post-construction design review to confirm that the completed liner meets the design objectives relative to structural requirements prior to Total Performance. The design review will utilize all reported Quality Control testing records provided in accordance with E13.6.3.

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

(c) Defects in GRP liners will be reviewed on a case by case basis by the Contract Administrator. The Contract Administrator will consult with the Contractor and taking into account the condition of the host pipe prior to lining, the GRP installation conditions, and the long term use of the sewer to assess the structural and performance ramifications of the defects.

(d) The Contractor shall:

(i) Perform necessary remedial measures to confirm that a liner deemed to be structurally deficient will comply with the 50 year design life requirement such as determination of a more representative groundwater elevation locally through monitoring, undertake additional measurements to confirm install conditions, and supplemental sampling and strength testing.

(ii) Repair sections of GRP removed for supplemental by insertion of extra GRP panel material using an acceptable structural adhesive or repairing with a resin-rich repair product such as an epoxy based repair system that is compatible with the liner system and specifically designed for the nature, size and thickness of the patch being repaired to form a smooth watertight patch flush with liner.

(iii) Install a supplemental liner to structurally enhance the installed GRP liner if supplemental testing fails to confirm the GRP will meet the 50 year design life requirement.

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

(v) The Contractor shall perform further testing, monitoring, calculations, and install structural enhancements at their own cost.

E13.10 Measurement and Payment

E13.10.1 Sewer Cleaning

(a) Sewer cleaning will be measured and paid for in accordance with CW 2140 and E10.7.1.

E13.10.2 Sewer Preparation and Repairs Prior to Lining

(a) Sewer repairs and preparation for lining will be measured and paid for in accordance with E10.7.2.

E13.10.3 GRP Sliplining

(a) Liner installation will be measured on a length basis for each sewer to be lined and paid for at the Contract Unit Price for “Supply and Installation of Structural Sewer Liner”. Length to be paid for will be the total length of GRP liner supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(b) Measurement will be made horizontally at grade, above the centreline of the pipe from centre to centre of manholes or termination of the liner where termination is not at a manhole location.

(c) Payment for the supply and installation of GRP liners shall include but is not limited to the following:

(i) Verification of existing sewer dimensions;

(ii) Submission of all specified submittals;

(iii) Shear bond testing;

(iv) Supply and installation of GRP liner;

(v) Grouting of GRP liner;

(vi) Transitions at liner termination;

(vii) Provision of test samples;

(viii) Quality control testing and records; and,

(ix) Any other materials and labour as specified herein.

(d) Payment for the supply and installation of GRP liners will be made on the following payment schedule;

(i) 30% payment upon delivery of the GRP panels to Winnipeg and inspection/acceptance by the Contract Administrator.

(ii) 80% payment upon installation and completion of the grouting operations.

(iii) 100% payment upon completion of all work incidental to the GRP liner installation, confirmation of QA testing results, delivery and acceptance of all required submissions, shop drawings, and reports, rectification of all identified defects, and acceptance by the Contract Administrator.

E13.10.4 Reinstatement of Sewer Services

(a) Reinstatement of sewer services will be measured and paid for in accordance with E11.3.2.

E13.10.5 Quality Control Records

(a) Preparation of quality control records shall be considered incidental to “Supply and Installation of Structural Sewer Liner” and will not be measured for payment. No separate payment shall be made.

E13.10.6 Quality Control Sampling and Testing

(a) All work and materials required for the preparation and recovery of samples, repair of GRP liners, supply of grouting test samples, and QA testing as specified shall be considered incidental to “Supply and Installation of Structural Sewer Liner” and will not be measured for payment. No separate payment shall be made.

E14. CENTRIFUGALLY CAST CONCRETE PIPE (CCCP) AND GEOPOLYMERS

E14.1 Description

(a) This specification covers the supply and installation of CCCP and Geopolymer sewer liners.

(b) For the purposes of this Contract any references to CCCP apply to both CCCP and Geopolymer materials/lining systems.

E14.2 References:

(a) ASTM C267 – Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes;

(b) ASTM C469 – Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression; and,

(c) CSA A23.2 – Test Methods and Standard Practices for Concrete.

E14.3 Approved Systems

(a) CentriPipe by AP/M Permaform;

(b) GeoSpray by GeoTree Technologies Inc;

(c) or approved equal in accordance with B7.

E14.4 Submittals

E14.4.1 Installation of CCCP/Geopolymer liners shall not commence prior to submission of the submissions identified herein and review by the Contract Administrator.

E14.4.2 CCCP/Geopolymer Shop Drawings

(a) Provide a design submission and shop drawings for review by the Contract Administrator in accordance with E2 a minimum of fifteen (15) Business Days prior to starting lining operations. The submission shall include the following:

(i) Name and manufacturer of the cementitious liner material;

(ii) Physical properties of the cementitious liner material in accordance with E14.8:

- Compressive strength
- Flexural modulus
- Flexural strength
- Tensile strength
- Stress vs. strain curves for all strength parameters

(iii) Confirmation of durability of the liner design relative to the exposed service conditions;

(iv) Host pipe measurements identified in E7.2.1, including the following:

- Sewer length
- Host pipe dimensions
- Sewer invert depths

(v) Pre-design inspection where specified

(vi) Other information that may reasonably be required by the Contract Administrator to confirm the CCCP/Geopolymer product is consistent with the design, field conditions, and proposed material.

E14.4.3 Liner Installation Procedure

(a) The Contractor shall submit a detailed step-by-step procedure of all key liner preparation and installation activities and processes in accordance with E2 a minimum of ten (10) Business Days prior to starting lining operations. This procedure submission shall include as a minimum:

(i) Proposed main line and sewer service flow control arrangements in accordance with E6. Note, flow control plans may be submitted separate from the liner installation protocol.

(ii) Identification of any services and support required to complete installation.

(iii) List of equipment that will be available and used for the project.

(iv) Material handling, storage and disposal requirements for all raw materials and project waste.

(v) Details of pipeline preparation for acceptance of the liner, including procedures for:

- Cleaning the pipe surfaces.
- Repairing the pipe surfaces to satisfactory cross section or profile.
- Creating and maintaining environmental conditions to facilitate installation of the liner.

(vi) Details of liner preparation and installation:

- A sufficiently concise, detailed timeline listing all key steps in the preparation, transfer and installation of the liner. The level of detail provided shall be sufficient to facilitate “near-continuous monitoring of progress by the Contract Administrator or their representative during the course of the shutdown.

(vii) Estimated length of time required to reinstate the pipeline.

E14.4.4 QA/QC Plan

(a) The Contractor shall submit a Quality Management Plan in accordance with E2 a minimum of ten (10) Business Days prior to starting lining operations. The Quality Management Plan shall consist of the following:

(i) Name and relevant experience of Quality Control Supervisors and staff that will be present on-site to perform the required quality control activities.

(ii) Example Quality Control Record forms to adequately document requirements of the Quality Assurance/ Quality Control section of this specification.

(iii) Proposed on site quality control testing program.

(iv) Proposed independent test laboratory and relevant certifications.

E14.5 Design of CCCP/Geopolymer Liners

E14.5.1 Design Objectives

(a) Maximizing the structural enhancement of the sewer by installing a CCCP/Geopolymer liner.

(b) Maintain or increase the hydraulic capacity of the rehabilitated sewer.

(c) Reduce infiltration and exfiltration.

(d) Prevent root intrusion.

(e) Provide sufficient chemical resistance to prevent further sewer pipe degradation related to the conveyance of sewage.

(f) Minimize disturbance to pavements and boulevards.

(g) Minimize disruption to vehicular and pedestrian traffic.

(h) Minimize the impact of construction on commercial, industrial, and institutional facilities.

E14.5.2 General

(a) Utilize materials with chemical and mechanical properties that are capable of providing a minimum design life of 50 years based on the waste stream present.

(b) Long-term values 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 materials proposed for use. Physical properties shall be verified by an accredited testing agency.

(c) Final internal sewer dimensions (post lining) shall not be less than those identified on the Drawings.

E14.5.3 The following section outlines the construction requirements for CCCP/Geopolymer liners.

(a) Designs were completed in accordance with Appendix B and the following Parameters:

(i) WRc Sewerage Rehabilitation Manual, Type 1 Design

(ii) Soil Density: 18.85 kN/m^3

(iii) Live Load: AASHTO HS20

(iv) Water Table Depth: 2.0 m below grade

(v) Factor of Safety: 2.0

(vi) Soil Stresses: Effective Stress

(vii) Minimum CCCP/Geopolymer liner material properties:

- 28 Day Flexural Modulus: 24,130 MPa
- 28 Day Flexural Strength: 6.5 MPa
- 28 Day Tensile Strength: 4.5 MPa

(viii) Steel Reinforcement Yield Strength: 200 MPa (WRc Criteria)

(b) CCCP/Geopolymer liners shall meet the following requirements

Sewer Asset	Shape	Height (mm)	Width (mm)	Max Height	Max Width	Max Invert	CCCP Liner	Required Reinforcing

				(mm)	(mm)	Depth (m)	Thickness (mm)	Steel Area (mm/m)
S-MA20016321	Circular	1500	-	1600	-	7.0	70	1550
S-MA20018612	Egg	1500	1000	1600	1100	6.1	65	1425
S-MA20019010	Egg	1500	1000	1600	1100	6.0	60	400
S-MA50004316	Egg	1700	1100	1800	1200	8.6	85	600
S-MA50004315	Egg	1700	1100	1800	1200	8.6	85	600
S-MA70003174	Egg	1700	1100	1800	1200	8.6	85	600

(c) The following steel reinforcement are provided for consideration in selecting a steel reinforcing scheme:

Sewer Asset	Shape	CCCP Liner Thickness (mm)	Required Reinforcing Steel Area (mm/m)	Suggest Wire/Bar Size	Suggested Wire/Bar Spacing (mm)
S-MA20016321	Circular	70	1550	W12/D12	50
S-MA20018612	Egg	65	1425	W12/D12	50
S-MA20019010	Egg	60	400	W8/D8	100
S-MA50004316	Egg	85	600	W10/D10	100
S-MA50004315	Egg	85	600	W10/D10	100
S-MA70003174	Egg	85	600	W10/D10	100

(d) Steel Reinforcement shall meet the following requirements:

(i) Minimum steel area identified herein

(ii) Max wire/bar size: W30/D30 or M15

(iii) Max wire/bar spacing: 100 mm

(iv) Interior concrete cover: 25 mm

E14.6 Materials

E14.6.1 Centrifugally applied cementitious liner material:

(a) Liner material shall consist of fine aggregate concrete composite material design for use with centrifugal applications and meeting the following minimum characteristics measured in accordance with E14.8:

(i) 28 day Compressive Strength: 55 MPa

(ii) 28 Day Flexural Modulus: 24,130 MPa

(iii) 28 day Flexural Strength: 6.5 MPa

(iv) 28 Day Tensile Strength: 4.5 MPa

(b) The CCCP/Geopolymer product shall exhibit a minimum shear bond between the grout and host sewer of minimum of 0.68 MPa.

(c) Sulphate resistance: No damage after 30 days with a 5% solution of H_2SO_4 when tested in accordance with ASTM C267.

(d) Liner material may incorporate steel or synthetic reinforcing fibres as required to achieve design tensile strengths.

(e) Cementitious liner material shall incorporate protection against hydrogen sulfide gas related deterioration. Approved product: ConShield or approved equal in accordance with B7.

(f) Approved CCCP Product: Permacast PL-8000 and PL-12000 w/ Crystal-X as manufactured by AP/M Permaform or approved equal in accordance with B7.

E14.6.2 Steel reinforcement shall meet the requirements of ASTM A1064 or CW 2160.

E14.7 Construction Methods

E14.7.1 Verification of Existing Sewer Dimensions

(a) Verify dimensional requirements of each sewer to be rehabilitated prior to design in accordance with E7.2.1.

E14.7.2 Surface Preparation:

(a) Prepare the concrete surface per the manufacturer's recommendations, E10.3, and as specified herein. Surface preparation shall promote continuous intimate contact between the liner and concrete by providing a clean, uniform surface.

(b) The host pipe shall be thoroughly cleaned using water jetting or other acceptable methods prior to lining in accordance with WRc, Sewerage Rehabilitation Manual, Section 9.2.3. The host pipe shall be free of organic materials, biological slime, roots, soft encrustation, and grease which may inhibit bonding to the host pipe.

(c) All voiding and holes in the host pipe shall be filled and repaired with a competent cementitious material compatible with the host pipe and lining material to form a uniform and consistent substrate for application of the liner. Discontinuities in the host pipe shall be repaired and shaped to match the design cross section of the liner.

(d) Any repairs to the host pipe shall be completed with a competent cementitious material compatible with the host pipe, grout, and liner. Repairs shall not compromise the intended structural behaviour or performance of the rehabilitated structure.

(e) All leakage and infiltration shall be sealed prior to lining.

E14.7.3 Application:

(a) The CCCP/Geopolymer liner shall be installed in accordance with manufacturer's recommendations and as specified herein.

(b) Application of the liner shall not commence until the host pipe has been inspected by the Contract Administrator.

(c) The pipe shall be completely dewatered and free of debris, sewage, and other foreign material.

(d) Services shall not be permitted to flow into the host pipe during the lining operation.

(e) The sprayer head shall be centered in the pipe (circular host pipes) or positioned to provide as equal distribution as possible within non-circular pipes.

(f) Design thicknesses shall be measured from the highest point on the host pipe in accordance with E14.9.2 and in a location with the lowest level of material placement (furthest from the sprayer head). CCCP/Geopolymer material applied to fill holes and voids will not be considered part of the liner.

(g) Transitions to the host pipe are required where liner thicknesses are greater than 25 mm. Construct transitions in accordance with the Drawings and E13.8.3 using materials compatible with the liner or meeting the requirements of E13.5.3.

E14.7.4 Shaft Closures

(a) At access shafts where CCCP/Geopolymer liners cannot practically provide a fully restored sewer invert and obvert the Contractor shall restore the existing host pipe as follows:

(i) Restore the invert up to the interface with cast-in-place concrete closure using an approved cementitious repair product consistent with the CCCP/Geopolymer liner or in accordance with E13.5.3.

(ii) Invert restoration shall be completed in accordance with the product manufacturer's recommendations with flow control measures in place and shall be permitted to cure sufficiently prior to exposure to sewage. The closure shall be constructed to a thickness equaling the thickness of the liner. The closure shall not result in a low spot or sump within the sewer.

(iii) Provide a smooth and level transition from liner to the closure location.

(iv) The obvert of the host pipe shall be restored with a cast in place concrete closure as shown on the Drawings and in accordance with E8. The cast-in-place concrete closure shall be formed from within the sewer to provide a smooth and level transition from the new liner.

E14.7.5 Reinstatement of Sewer Services

(a) Reinstate all active and indeterminate sewer services including CB leads and utility drains to 100% of the original cross sectional area.

(b) Remove sharp edges from opening cut outs and provide a smooth rounded lip.

(c) Sewer Service Grouting

(i) Grout sewer services to provide a smooth transition into the new host pipe without a loss of cross sectional area. Fill any voiding between the host pipe/liner and the sewer service.

(ii) Complete sewer service grouting in accordance with E10.

E14.8 Demonstration Testing

(a) The contractor shall complete one demonstration test to confirm host pipe preparation and liner application procedures. Demonstration testing may be completed within one of the sewers or in an above ground test representative of the sewers to be rehabilitated in the project. This includes host pipe cross section and material.

(b) Demonstration testing shall demonstrate the ability to achieve bond with the host pipe and uniform application thicknesses.

(c) The host pipe preparation for the demonstration testing shall be in accordance with the submitted and accepted installation procedures. QA sampling and testing shall be completed on the applied product in accordance with E14.9.

(d) Bond testing shall be undertaken in accordance with CSA A23.2-6B or equivalent and pull off bond capacity shall exceed 0.68 MPa.

E14.9 Quality Assurance/Quality Control (QA/QC)

E14.9.1 Quality control for cementitious lining materials shall conform to CSA A23.2, expect as modified herein:

(a) Confirm the slump or viscosity (as appropriate) of the material a minimum of once per production run, for every 25 m^3, or once per 30 minutes, whichever is more frequent. The intent is to ensure conformance with the submitted material properties.

(i) Slump Tests shall conform to CSA A23.2-5C.

(ii) Viscosity tests shall conform to CSA A23.2-1B.

(b) Confirm the density of the material in accordance with CSA A23.2-6C. Density shall be measured and recorded once per production run, for every 25 m^3, or once per 30 minutes, whichever is more frequent. The density shall be maintained within +/- 10 % of the design density.

(c) Prepare and test quality control samples for compressive strength and density in accordance with CSA A23.2-1B. Prepare a minimum of four (4) test cubes for each production run, or every 25 m^3, whichever is more frequent. The Contractor shall arrange to have test cubes tested at an approved testing facility in accordance with

CSA A23.2-1B. Two (2) samples shall be tested at 24 hours and Two (2) samples shall be tested at 28 days to confirm compressive strengths.

(d) Prepare and test quality control samples for flexural strength in accordance with CSA A23.2-8C. Prepare a minimum of two (2) samples for each production run, or every 25 m^3, whichever is more frequent. The Contractor shall arrange to have samples tested at an approved testing facility in accordance with CSA A23.2-8C.

(e) Prepare and test quality control samples for tensile strength in accordance with CSA A23.2-13C. Prepare a minimum of two (2) test cylinders for each production run, or every 25 m^3, whichever is more frequent. The Contractor shall arrange to have cylinders tested at an approved testing facility in accordance with CSA A23.2-13C.

(f) Prepare and test quality control samples for modulus of elasticity in accordance with ASTM C469. Prepare a minimum of two (2) test cylinders for each production run, or every 25 m^3, whichever is more frequent. The Contractor shall arrange to have cylinders tested at an approved testing facility in accordance with ASTM C469.

(g) Where steel or synthetic fibres are utilised the fibre content shall be determined in accordance with CSA 23.2-16C. Tests for fibre content shall completed for each production run, or every 25 m^3, whichever is more frequent.

(h) Bond with the host pipe shall be tested in accordance with CSA A23.2-6B. A minimum of one bond test shall be completed per liner. Minimum bond strength shall be 0.68 MPa.

E14.9.2 Confirmation of CCCP/Geopolymer liner thickness shall include the following minimum checks:

(a) Gauges (consisting of guide strips or wires) shall be utilized to confirm the thickness of the liner. Gauges shall be placed at the invert, springline, and obvert of the pipe a minimum of every 5 m.

(b) A minimum of one core shall be completed per liner to confirm placed liner thickness. Cores shall be completed and measured in the presence of the Contract Administrator. Core holes shall be repaired with a cementitious or geopolymer type product compatible with the liner material.

E14.9.3 Quality Control Records

(a) Maintain the following Quality Control records of the work including all testing identified herein and provide to the Contract Administrator after completion of the work.

E14.9.4 Post installation inspection of the pipe lining shall be completed through CCTV inspection in accordance with E7. A walk-through inspection may be required with the Contract Administrator inspecting for defects and imperfections by visual and hammer tap surveys, including delamination from the host pipe, this spots. Repair defects identified in the inspection by approved methods.

E14.10 Post Construction Design Review for Total Performance

(a) The Contract Administrator will perform a post-construction design review to confirm that the completed CCCP/Geopolymer liner meets the 50 year design life structural requirements prior to issuance of Total Performance. The design review will utilize QA testing reports.

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

(c) Defects in the liners will be reviewed on a case by case basis by the Contract Administrator. The Contract Administrator will consult with the Contractor and taking into account the condition of the host pipe prior to lining, the CCCP/Geopolymer installation conditions, and the long term use of the sewer to assess the structural and performance ramifications of the defects.

(d) The Contractor shall:

(i) Perform necessary remedial measures to confirm that a liner deemed as structurally deficient will comply with the 50 year design life requirement such as confirmation of actual ovality, determination of a more representative groundwater elevation locally through monitoring, and supplemental strength testing and thickness measurements.

(ii) Repair sections of liner removed for supplemental testing by patching with a cementitious material compatible with the liner.

(iii) Install a supplemental liner of the required thickness to structurally enhance the installed CCCP/Geopolymer liner if supplemental testing fails to confirm the CCCP/Geopolymer will meet the 50 year design life requirement.

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

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

E14.11 Measurement and Payment

E14.11.1 Sewer Cleaning

(a) Sewer cleaning will be measured and paid for in accordance with CW 2140 and E10.7.1.

E14.11.2 Sewer Preparation and Repairs Prior to Lining

(a) Sewer repairs and preparation for lining will be measured and paid for in accordance with E10.7.2.

E14.11.3 CCCP and Geopolymer Installation

(a) Liner installation will be measured on a length basis for each size and paid for at the Contract Unit Price for “Supply and Installation of Structural Sewer Liner”. Length to be paid for will be the total length of liner supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(b) Measurement will be made horizontally at grade, above the centreline of the pipe from centre to centre of manholes or termination of the liner where termination is not at a manhole location.

(c) Payment for the supply and installation of CCCP and Geopolymer liners shall include but is not limited to the following:

(i) Verification of existing sewer dimensions;

(ii) Submittals, including: CCCP/Geopolymer designs, material samples, material testing, operations protocol, and construction protocol;

(iii) Demonstration testing;

(iv) All required sewer preparation work;

(v) Supply and installation of CCCP/Geopolymer liner;

(vi) Quality control testing and records; and

(vii) Any other materials and labour as specified herein.

(d) 80% of the payment will be made upon satisfactory completion of the CCCP/Geopolymer liner installation work.

(e) 100% of the payment will be made upon confirmation of the material strengths, delivery and acceptance of all required submissions, shop drawings, and reports, and rectification of all identified defects.

E14.11.4 Reinstatement of Sewer Services

(a) Reinstatement of sewer services will be measured and paid for in accordance with E11.3.2.

E14.11.5 Quality Control Records

(a) Preparation of quality control records shall be considered incidental to “Supply and Installation of Structural Sewer Liner” and will not be measured for payment. No separate payment shall be made.

E14.11.6 Quality Control Sampling and Testing

(a) All work and materials required for the preparation and recovery of samples, repair of liners, and QA testing as specified herein shall be considered incidental to “Supply and Installation of Structural Sewer Liner” and will not be measured for payment. No separate payment shall be made.

E15. CAST-IN-PLACE CONCRETE

E15.1 Description

(a) This Specification shall cover the construction of cast-in-place concrete trunk sewer closures.

(b) All cast-in-place concrete shall be carried out in accordance with CW 2160 and CSA A23.1, except as amended or supplemented herein

E15.2 Submissions

E15.2.1 Construction Method Submission

(a) No Work shall commence 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.

E15.3 Materials

(a) Structural Concrete Mix Design

(i) Provide concrete mixed in accordance with requirements of CW 2160 and CSA-A23.2. Concrete shall conform to requirements of Type A concrete in accordance with Table CW 2160.1.

(ii) Structural concrete design shall be in accordance with performance specification having the following properties:

- Class of Exposure: S-1
- Minimum Compressive Strength @ 28 days: 35 MPa

(b) Polyurethane sealant for manhole construction

(i) Shall be non sag, polyurethane sealant; Sikaflex 2C NSL, or approved equal in accordance with B7. Colour: Precast.

(c) Hydrophilic Waterstop

(i) One-part polyurethane, extrudable swelling waterstop (bentonite-free). Sikaswell S-2 or approved equal in accordance with B7.

E15.4 Construction Methods

E15.4.1 Forming

(a) The Contractor shall be responsible for the design and installation of all necessary shoring, bracing and formwork.

(b) All shoring shall conform to CW 2160, CSA S269.3 and CSA C23.1.

E15.4.2 Cast-in-Place Concrete

(a) All cast-in-place concrete shall conform to CW 2160, and CSA A23.1.

E15.5 Measurement and Payment

(a) Supply and placement of cast-in-place concrete shall be considered incidental to “Pipeline Access” and will not be measured for payment. No separate payment will be made.

E16. REINFORCING STEEL

E16.1 Description

(a) This Specification shall cover all reinforcing steel work, in accordance with Specification CW 2160, except as amended or supplemented herein.

E16.2 Submittals

(a) The Contractor shall submit reinforcing steel Shop Drawings in accordance with E2 a minimum of ten (10) Business Days prior to the fabrication of any reinforcing steel.

E16.3 Materials

E16.3.1 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.

E16.3.2 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 that may be approved by the Contract Administrator. 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.

E16.4 Construction Methods

E16.4.1 Placing of Reinforcing Steel

(a) Placement of reinforcing steel shall be completed in accordance with CW 2160, CSA A23.1, and CSA A23.3.

(b) Lap splices in accordance with CSA A23.3

(c) 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.

(d) 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.

(e) 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.

E16.4.2 Quality Control

(a) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

E16.5 Measurement and Payment

(a) Supply and placement of reinforcing steel shall be considered incidental to "Pipeline Access" and will not be measured for payment. No separate payment will be made.

E17. CATCH BASIN LEAD INSPECTIONS

E17.1 Description

E17.1.1 This specification shall cover the cleaning and inspection of catch basin leads connected to sewers included in this contract to be lined with CIPP for the purpose of determining whether the catch basin lead requires repair work. The Contractor shall clean and inspect catch basin leads as directed by the Contract Administrator.

E17.2 Construction Methods

E17.2.1 Cleaning

(a) Clean catch basin leads in accordance with CW 2140.

E17.2.2 Video Inspections and Inspection Reports

(a) Perform video inspection from catch basin to mainline sewer in accordance with CW 2145. No coding of the submission will be required.

E17.2.3 Repair Work

(a) Catch basin lead repairs identified from the inspections will be done (by others) prior to lining work to the corresponding sewer main.

E17.3 Measurement and Payment

E17.3.1 Provisional - Cleaning

(a) Cleaning of catch basin leads shall be measured and paid for in accordance with CW 2140.

E17.3.2 Provisional - Video Inspections

(a) Video Inspection of catch basin leads shall be measured and paid for in accordance with CW 2145.

E18. SUSPENSION OF WORK ACTIVITIES WHEN SEWER CONTROL GATES ARE ACTIVATED DURING PERIODS OF HIGH RIVER LEVELS

E18.1 The Contractor is advised that as the elevation of the Red and Assiniboine Rivers rise from the normal winter or summer levels due to spring runoff or periods of heavy rainfall the City is required to close various control gates located on sewer system outfalls. Similarly, as the elevation of the rivers drop to normal levels, the City is required to open the control gates that have been closed. Control gates begin to be closed when river levels reach elevation 224.51 (James Avenue 9.0). As well, higher river levels can cause the level of flow in sewers to be higher than normal.

E18.2 In the event the Red and Assiniboine Rivers rise to an elevation where the City has to begin closing control gates, the Contract Administrator will direct that work activities in any sewers affected by the gate closure be suspended and the risk of runoff causing flooding in the sewer

evaluated. Work will continue to be suspended as long as there is a risk of the sewer being flooded while the control gate is closed unless the Contractor provides flow control measures approved jointly by the Contract Administrator, City of Winnipeg Collection System and Flood Control Branch and Local Services Branch.

E18.3 Similarly, as river elevations drop and the City has to open control gates that have been closed, the Contract Administrator will direct that work activities in any sewers affected by the control gate opening be suspended due to the risk of the river flooding the sewer once the gate is opened. Work will continue to be suspended as long as the sewer is being flooded from the river unless the Contractor provides flow control measures approved jointly by the Contract Administrator, City of Winnipeg Collection System and Flood Control Branch and Local Services Branch.

E18.4 The Contractor will have no claim for extra Work or compensation as a result of suspension of Work due to the City closing and opening control gates during periods of rising and dropping river levels. If in the opinion of the Contract Administrator the suspension will cause the completion of the Work to occur after the specified date for Substantial Performance and the Contractor's schedule would have reasonably permitted completion of the Work before the required date, the date for Substantial Performance will be adjusted accordingly.

E18.5 The flood activation elevations for each site will be available upon request prior to construction.

E19. WATER SUPPLY

E19.1 Further to Section 3.14 of CW 2140 and Section 3.7 of CW 1120 of the General Requirements water supply for the Work may be taken from City of Winnipeg hydrants.

E19.2 The Contractor shall make the following arrangements for hydrant turn on and turn off.

(a) Contact City of Winnipeg Water Services Division (WSD) for hydrant turn on and turn off required between 0800 hours and 1500 hours Monday to Friday. Notice for turn on and turn off shall be provided on the previous business day.

(b) Contact Emergency Services Branch (986-2626) with a minimum of 2 hours notice for hydrant turn on and turn off required outside of the above hours.

(c) The Contractor shall wait at the hydrant from the requested turn on or turn off time until City staff arrives to turn on or turn off the hydrant.

E19.3 Hydrants shall be considered to be "in the Contractor's control" from the time the City has turned the hydrant on until the City has turned the hydrant off.

E19.4 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.

E19.5 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.

E19.6 The Contractor shall provide a traffic ramp for hydrant connection hoses that cross roadways. The ramp shall be designed and constructed to not present a hazard to vehicles travelling over it and to ensure that no part of the hose is run over by a motor vehicle. Traffic ramps shall be satisfactory to the Contract Administrator.

E19.7 Measurement and Payment

(a) Charges incurred for the permits and water meters shall be paid for by the Contractor when the permit is 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.

(b) All other costs associated with sourcing construction water will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E20. RESTORATION

E20.1 Description

(a) This Specification shall cover the restoration of all work sites.

E20.2 Restoration Works

(a) Reconstruct concrete pavements in accordance with CW 3230, CW3310, and SD-213A.

(b) Reconstruct asphalt pavements and overlays in accordance with CW3410 using a Type 1A asphaltic concrete pavement.

(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 barrier curbs in accordance with CW3240 and SD-206A.

(e) Sod all maintained grassed areas in accordance with CW3510.

E20.3 Measurement and Payment

(a) Surface restoration will be considered incidental to “Pipeline Access” 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.

Appendix A

Host Pipe Conditions and Inspections

Appendix B

Design Conditions

Appendix C

Traffic Control General Requirements

Appendix D

Design Curves

Appendix E

Site Photos

Appendix F

Record Drawings

Appendix G

AECOM Confined Space Entry Procedure