



THE CITY OF WINNIPEG

TENDER

TENDER NO. 718-2022

RIVERBEND LIFT STATION UPGRADES

TABLE OF CONTENTS

PART A - BID SUBMISSION

- Form A: Bid/Proposal
- Form B: Prices
- Form G1: Bid Bond and Agreement to Bond

PART B - BIDDING PROCEDURES

| | |
|---|---|
| B1. Contract Title | 1 |
| B2. Submission Deadline | 1 |
| B3. Site Investigation | 1 |
| B4. Enquiries | 1 |
| B5. Confidentiality | 2 |
| B6. Addenda | 2 |
| B7. Substitutes | 2 |
| B8. Bid Components | 3 |
| B9. Bid | 3 |
| B10. Prices | 4 |
| B11. Disclosure | 5 |
| B12. Conflict of Interest and Good Faith | 5 |
| B13. Qualification | 6 |
| B14. Bid Security | 7 |
| B15. Opening of Bids and Release of Information | 8 |
| B16. Irrevocable Bid | 8 |
| B17. Withdrawal of Bids | 8 |
| B18. Evaluation of Bids | 8 |
| B19. Award of Contract | 9 |

PART C - GENERAL CONDITIONS

| | |
|------------------------|---|
| C0. General Conditions | 1 |
|------------------------|---|

PART D - SUPPLEMENTAL CONDITIONS

General

| | |
|--|---|
| D1. General Conditions | 1 |
| D2. Form of Contract Documents | 1 |
| D3. Scope of Work | 1 |
| D4. Site Investigation Due Dilligence and Risk | 2 |
| D5. Definitions | 3 |
| D6. Contract Administrator | 3 |
| D7. Contractor's Supervisor | 3 |
| D8. Accessible Customer Service Requirements | 3 |
| D9. Unfair Labour Practices | 4 |
| D10. Furnishing of Documents | 5 |

Submissions

| | |
|-------------------------------------|---|
| D11. Authority to Carry on Business | 5 |
| D12. Safe Work Plan | 5 |
| D13. Insurance | 5 |
| D14. Contract Security | 6 |
| D15. Subcontractor List | 6 |
| D16. Detailed Work Schedule | 7 |

Schedule of Work

| | |
|--|---|
| D17. Commencement | 7 |
| D18. Critical Stages | 8 |
| D19. Substantial Performance | 8 |
| D20. Total Performance | 8 |
| D21. Liquidated Damages | 8 |
| D22. Supply Chain Disruption Schedule Delays | 9 |

Control of Work

| | |
|--|----|
| D23. Job Meetings | 9 |
| D24. Prime Contractor – The Workplace Safety and Health Act (Manitoba) | 10 |
| D25. The Workplace Safety and Health Act (Manitoba) – Qualifications | 10 |

Measurement and Payment

| | |
|--------------|----|
| D26. Payment | 10 |
|--------------|----|

Standardization

| | |
|---|----|
| D27. Standardized Equipment | 10 |
| D28. Contractual Arrangement | 10 |
| D29. Payment of Standardization vendors | 10 |

Warranty

| | |
|---------------|----|
| D30. Warranty | 11 |
|---------------|----|

Dispute Resolution

| | |
|-------------------------|----|
| D31. Dispute Resolution | 11 |
|-------------------------|----|

Third Party Agreements

| | |
|--|----|
| D32. Funding and/or Contribution Agreement Obligations | 12 |
| Form H1: Performance Bond | 15 |
| Form H2: Labour and Material Payment Bond | 17 |
| Form J: Subcontractor List | 19 |

PART E - SPECIFICATIONS

General

| | |
|--|---|
| E1. Applicable Specifications and Drawings | 1 |
|--|---|

General Requirements

| | |
|--|----|
| E2. Hazardous Materials | 5 |
| E3. Contractor Supplied Standardized Equipment | 5 |
| E4. Standardized PLC Control System and Motor Control Equipment | 6 |
| E5. Standardized Instrumentation | 8 |
| E6. Mobilization and Demobilization Payment | 10 |
| E7. Additional Work | 12 |
| E8. Traffic Control | 13 |
| E9. Waterway By-Law | 13 |
| E10. Temporary Use of City Equipment | 13 |
| E11. Wet Well Cleanout | 14 |
| E12. Existing Pumping Station Operation during Construction | 14 |
| E13. Temporary Shutdown of the Pumping Station | 14 |
| E14. Flow Control: Permanent By-Pass Manhole and Temporary By-Pass Pumping | 15 |
| E15. Wet Weather Flows in Existing Sewer | 19 |
| E16. Pre-Cast Concrete Rectangular Box Section | 19 |
| E17. Regulatory Approvals and Permits | 19 |
| E18. Structural Concrete | 19 |
| E19. Supplying and Placing Reinforcing Steel | 40 |
| E20. Supply, Fabrication and erection of miscellaneous metal | 45 |
| E21. Patching of Existing Pavement | 53 |

Appendices

| | |
|--|--|
| Appendix 'A' – DNP3 I/O Index | |
| Appendix 'B' – Instrumentation Index | |
| Appendix 'C' – Process Control Narrative | |
| Appendix 'D' – Arc Flash Study | |
| Appendix 'E' – Variable Frequency Drive Settings | |

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 RIVERBEND LIFT STATION UPGRADES

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 11, 2023.

B2.2 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the Contract Administrator or an authorized representative will be available at the Site at Riverbend Lift Station located at 1740 Portage Avenue from 10:30 a.m. to 11:30 a.m. on August 1, 2023 to provide Bidders access to the Site.

B3.2 The Bidder is advised that CSA approved personal protective equipment (PPE) consisting of but not limited to safety boots and hard hat will be required.

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

B3.4 The Bidder is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid or their performance of the Work, and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection.

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D6.1.

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;
 - (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 they have 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 D6.

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; and

- (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 their 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 they wish 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 their 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; and
- (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 their own name, their 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; and
 - (d) if the Bidder is carrying on business under a name other than their 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 (2) 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 their 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 their duly authorized officer or officers; and
 - (d) if the Bidder is carrying on business under a name other than their 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 (2) or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.
- 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 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 D32. Any such costs shall be determined in accordance with D32.
- B10.1.2 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.
- B10.2 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) Nothart Engineered Sales Ltd. – Supplying pumps and valves, pre-purchased by the City.

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 their 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 their 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 their 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 their 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 their 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 their sole discretion:
- (a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of their 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 their 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 their 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 their 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;
 - (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;
 - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract;
 - (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba); and
 - (d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and D8).
- B13.4 Further to B13.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:
 - (i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

- (ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
 - (b) a report or letter to that effect from an independent reviewer acceptable to the City. A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>.
- B13.5 Further to B13.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at <http://www.accessibilitymb.ca/training.html> for anyone that may have any interaction with the public on behalf of the City of Winnipeg.
- B13.6 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B13.7 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 their 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; and
 - (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 (2) 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 (2) lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly 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 their 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; and
- (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 their Bid or in other information required to be submitted, that they are 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 (1) 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 their 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 D32 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 their 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 complete upgrade of all building and process equipment of the Riverbend Lift Station.

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

- (a) mobilization and demobilization;
- (b) by-pass manhole and valve assembly:
 - (i) installation of new by-pass manhole, piping, fittings and City supplied valve assembly;
- (c) flow control and temporary wastewater diversion and disposal:
 - (i) flow control and wastewater diversion during initial station construction; and
 - (ii) additional flow control and wastewater diversion will be required during switch over from resilient seat gate valves to non-resilient seat gate valves;
- (d) force main:
 - (i) excavation, bedding and backfill;
 - (ii) supply and installation of force main piping;
 - (iii) fittings such as bends and plugs;
 - (iv) connecting new force main to existing lift station and manhole;
 - (v) supply and installation of internal drop pipe in existing manhole;
 - (vi) hydrostatic leakage testing of force main piping;
 - (vii) abandonment of existing force main; and
 - (viii) surface restorations including concrete pavement slabs complete with asphalt overlay, boulevard and/or sidewalk, where required;
- (e) structural:
 - (i) demolition of existing building superstructure;
 - (ii) new superstructure;
 - (iii) hatches modification;
 - (iv) provision of motor room and pump room monorails for installing the City supplied motorized hoists;
 - (v) new building openings for heating, ventilation and air conditioning (HVAC) systems;
 - (vi) new main floor opening for electrical; and
 - (vii) miscellaneous structural improvements and reinforcement to existing building;
- (f) architectural:
 - (i) new hatch covers and guardrails;
 - (ii) rehabilitation of substructure, drywall and ceiling including insulation;

- (iii) painting of substructure walls and ceiling; and
- (iv) surface restorations including landscaping, fencing and concrete driveway repairs;
- (g) process mechanical:
 - (i) installation of City supplied pumps, motors and valves;
 - (ii) installation of temporary City supplied resilient seated gate valves;
 - (iii) removal of resilient seated gate valves and replacement with City supplied non-resilient seated gate valves;
 - (iv) replacement of all station process piping, fittings, valves along with new pumps and motors;
 - (v) replacement of all piping supports and bases;
 - (vi) addition of flow meter; and
 - (vii) modifications and addition to the wet well level measurement system;
- (h) building mechanical:
 - (i) replacement of HVAC system; and
 - (ii) plumbing (water) upgrades;
- (i) electrical and instrumentation:
 - (i) demolition of existing electrical system;
 - (ii) replacement of entire electrical distribution system including CSTE, MCC, panel-board, transformer, wall receptacles, lighting, conduit, cabling and instrumentation; and
 - (iii) new motor controls centre (MCC), new lift pump variable frequency drives and associated electrical Work;
- (j) automation:
 - (i) replacement of existing remote terminal unit (RTU) panels with a new PLC control panel, including programming of the PLC and HMI;
 - (ii) new HVAC control panel; and
 - (iii) integration and commissioning of lift station;
- (k) for details, refer to the Drawings and Technical Specifications.

D3.3 The following shall apply to the Services:

- (a) City of Winnipeg Green Building Policy: New City-Owned Buildings and major additions;
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=5989>
- (b) Universal Design Policy
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=3604>

D4. SITE INVESTIGATION DUE DILLIGENCE AND RISK

D4.1 Notwithstanding C3.1, the Contractor acknowledges that the site investigation reports and other site information included in this Tender have been provided to it and may be relied upon by the Contractor to the extent that the Contractor uses Good Industry Practice in interpreting such report(s) and site information and carries out the Work in accordance with Good Industry Practice based upon such report(s) and the information contained in them and such other site information. In the event that a site condition related to:

- (a) the location of any utility which can be determined from the records or other information available at the offices of any public authority or person, including a municipal corporation and any board or commission thereof, having jurisdiction or control over the utility;
- (b) the Site conditions, including but not limited to subsurface hazardous materials or other concealed physical conditions;
- (c) the location, nature, quality or quantity of the materials to be removed or to be employed in the performance of the Work;

- (d) the nature, quality or quantity of the Plant needed to perform the Work;
- (e) all matters concerning access to the Site, power supplies, location of existing services, utilities or materials necessary for the completion of the Work; and
- (f) all other matters which could in any way affect the performance of the Work;

that could not have been “properly inferable”, “readily apparent” and readily discoverable” using Good Industry Practice by the Contractor, results in additional Work which is a direct result of this newly discovered site condition, such additional Work will be considered by the City under Changes in Work.

D5. DEFINITIONS

D5.1 When used in this Tender:

- (a) “**As-Built Drawings**” or “**Record Drawings**” are construction Drawings that include all construction details and Materials of the completed Works;
- (b) “**O&M Manuals**” means Operations and Maintenance Manuals;
- (c) “**Standardized Goods**” or “**Standardized Equipment**” means the respective goods that have been standardized by the City;
- (d) “**Standardized Vendors**” means a Contractor or Supplier of Standardized Goods; and
- (e) “**Supply Chain Disruption**” means an inability by the Contractor to obtain goods or services from third parties necessary to perform the Work of the Contract within the schedule specified therein, despite the Contractor making all reasonable commercial efforts to procure same. Contractors are advised that increased costs do not, in and of themselves, amount to a Supply Chain Disruption.

D6. CONTRACT ADMINISTRATOR

D6.1 The Contract Administrator is Dillon Consulting Limited, represented by:

Blair Moore, P.Eng.
Project Manager

Telephone No. (204) 453-2301 ext. 4013
Email Address bmoore@dillon.ca

D6.2 At the pre-construction meeting, Blair Moore will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D7. CONTRACTOR'S SUPERVISOR

D7.1 At the pre-construction meeting, the Contractor shall identify their designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D8. ACCESSIBLE CUSTOMER SERVICE REQUIREMENTS

D8.1 The Accessibility for Manitobans Act (AMA) imposes obligations on The City of Winnipeg to provide accessible customer service to all persons in accordance with the Customer Service Standard Regulation (“CSSR”) to ensure inclusive access and participation for all people who live, work or visit Winnipeg regardless of their abilities.

D8.1.1 The Contractor agrees to comply with the accessible customer service obligations under the CSSR and further agrees that when providing the Goods or Services or otherwise acting on the City of Winnipeg’s behalf, shall comply with all obligations under the AMA applicable to public sector bodies.

D8.1.2 The accessible customer service obligations include, but are not limited to:

- (a) providing barrier-free access to goods and services;
- (b) providing reasonable accommodations;
- (c) reasonably accommodating assistive devices, support persons and support animals;
- (d) providing accessibility features e.g., ramps, wide aisles, accessible washrooms, power doors and elevators;
- (e) inform the public when accessibility features are not available;
- (f) providing a mechanism or process for receiving and responding to public feedback on the accessibility of all goods and services; and
- (g) providing adequate training of staff and documentation of same.

D9. UNFAIR LABOUR PRACTICES

- D9.1 Further to C3.2, the Contractor declares that in bidding for the Work and in entering into this Contract, the Contractor and any proposed Subcontractor(s) conduct their respective business in accordance with established international codes embodied in United Nations Universal Declaration of Human Rights (UDHR) <https://www.un.org/en/about-us/universal-declaration-of-human-rights> International Labour Organization (ILO) [https://www.ilo.org/global/lang--en/index.htm](https://www.ilo.org/global/lang-en/index.htm) conventions as ratified by Canada.
- D9.2 The City of Winnipeg is committed and requires its Contractors and their Subcontractors, to be committed to upholding and promoting international human and labour rights, including fundamental principles and rights at work covered by ILO eight (8) fundamental conventions and the UDHR which includes child and forced labour.
- D9.3 Upon request from the Contract Administrator, the Contractor shall provide disclosure of the sources (by company and country) of the raw materials used in the Work and a description of the manufacturing environment or processes (labour unions, minimum wages, safety, etc.).
- D9.4 Failure to provide the evidence required under D9.3, may be determined to be an event of default in accordance with C18.
- D9.5 In the event that the City, in its sole discretion, determines the Contractor to have violated the requirements of this section, it will be considered a fundamental breach of the Contract and the Contractor shall pay to the City a sum specified by the Contract Administrator in writing ("Unfair Labour Practice Penalty"). Such a violation shall also be considered an Event of Default, and shall entitle the City to pursue all other remedies it is entitled to in connection with same pursuant to the Contract.
- D9.5.1 The Unfair Labour Practice Penalty shall be such a sum as determined appropriate by the City, having due regard to the gravity of the Contractor's violation of the above requirements, any cost of obtaining replacement goods/services or rectification of the breach, and the impact upon the City's reputation in the eyes of the public as a result of same.
- D9.5.2 The Contractor shall pay the Unfair Labour Practice Penalty to the City within thirty (30) Calendar Days of receiving a demand for same in accordance with D9.5. The City may also hold back the amount of the Unfair Labour Practice Penalty from payment for any amount it owes the Contractor.
- D9.5.3 The obligations and rights conveyed by this clause survive the expiry or termination of this Contract, and may be exercised by the City following the performance of the Work, should the City determine, that a violation by the Contractor of the above clauses has occurred following same. In no instance shall the Unfair Labour Practice Penalty exceed the total of twice the Contract value.

D10. FURNISHING OF DOCUMENTS

- D10.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D11. AUTHORITY TO CARRY ON BUSINESS

- D11.1 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.

D12. SAFE WORK PLAN

- D12.1 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.
- D12.2 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>
- D12.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at their 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.

D13. INSURANCE

- D13.1 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 two million dollars (\$2,000,000.00) inclusive for loss or damage including personal injuries and death resulting from any one (1) accident or occurrence; and
 - (c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance.
- D13.2 Deductibles shall be borne by the Contractor.
- D13.3 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.

D13.4 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.

D14. CONTRACT SECURITY

D14.1 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.

D14.1.1 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; and
- (e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D14.1.1(b).

D14.1.2 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 their discretion, exercised reasonably, allows.

D14.1.3 Digital bonds passing the verification process will be treated as original and authentic.

D14.2 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.

D14.3 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 D14.1(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.

D15. SUBCONTRACTOR LIST

D15.1 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.

D16. DETAILED WORK SCHEDULE

D16.1 The Contractor shall provide the Contract Administrator with a detailed Work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents if applicable.

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

- (a) a critical path method (C.P.M.) schedule for the Work;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule; and
 - (c) a daily manpower schedule for the Work;
- all acceptable to the Contract Administrator.

D16.3 Further to D16.2(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) Contract award;
- (b) mobilization;
- (c) temporary by-pass pumping operations;
- (d) by-pass manhole and valve assembly;
- (e) station interior demolition, broken down by discipline;
- (f) process mechanical Work;
- (g) mechanical HVAC Work;
- (h) plumbing (water) Work;
- (i) electrical Work;
- (j) instrumentation Work;
- (k) building renovations;
- (l) hoist device Work;
- (m) equipment start-up;
- (n) commissioning;
- (o) Substantial Performance;
- (p) Total Performance; and
- (q) submission of O&M Manuals and As-Built Drawings.

D16.4 Further to D16.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or Specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D16.5 Further to D16.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

SCHEDULE OF WORK

D17. COMMENCEMENT

D17.1 The Contractor shall not commence any Work until they are in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D17.2 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 D11;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D12;
 - (iv) evidence of the insurance specified in D13;
 - (v) the Contract security specified in D14;
 - (vi) the Subcontractor list specified in D15;
 - (vii) the detailed Work schedule specified in D16; and
 - (viii) the direct deposit application form specified in D26.
- (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.

D18. CRITICAL STAGES

D18.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) The two (2) new pumping units must be put into fully automated service by March 1, 2024.

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by May 15, 2024.

D19.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D19.3 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.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by June 30, 2024.

D20.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D20.3 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.

D21. LIQUIDATED DAMAGES

D21.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

- (a) Critical Stage D18.1(a) – two thousand dollars (\$2,000.00);
- (b) Substantial Performance – one thousand dollars (\$1,000.00); and

(c) Total Performance – five hundred dollars (\$500.00).

D21.2 The amounts specified for liquidated damages in D21.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D21.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D22. SUPPLY CHAIN DISRUPTION SCHEDULE DELAYS

D22.1 The City acknowledges that the schedule for this Contract may be impacted by Supply Chain Disruption. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the delivery requirements and schedule identified in the Contract, in close consultation with the Contract Administrator.

D22.2 If the Contractor is delayed in the performance of the Work by reason of Supply Chain Disruption, 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.

D22.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether a Supply Chain Disruption will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to a Supply Chain Disruption, including but not limited to evidence related to availability ordering of Material or Goods, production and/or manufacturing schedules or availability of staff as appropriate.

D22.4 For any delay related to supply chain disruption 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 D22.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D22.5 The Work schedule, including the durations identified in D18 to D20 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.

D22.6 Where Work not previously identified is being carried over solely as a result of delays related to Supply Chain Disruption, 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 Supply Chain Disruption, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D22.7 Any time or cost implications as a result of Supply Chain Disruption and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

CONTROL OF WORK

D23. JOB MEETINGS

D23.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one (1) representative of the Contract Administrator, one (1) representative of the City and one (1) representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D23.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

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

D24.1 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).

D25. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D25.1 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 their sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4.

MEASUREMENT AND PAYMENT

D26. PAYMENT

D26.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

STANDARDIZATION

D27. STANDARDIZED EQUIPMENT

D27.1 The following goods have been standardized by the City and will be supplied by the Contractor:

- (a) Standardized PLC Control System Equipment and Motor Control Equipment as per E3; and
- (b) Standardized Instrumentation as per E4.

D28. CONTRACTUAL ARRANGEMENT

D28.1 Each Standardization Vendor shall be a Subcontractor of the Contractor.

D28.2 The City's contract with each of the Standardization Vendors defines the prices and general terms of supply to the Contractor. Each Standardization Vendor is obligated to enter into a contract with the Contractor, based upon such prices and general terms of supply.

- (a) The City is not a party to any contract between a Standardization Vendor and the Contractor, or any Subcontractor.

D28.3 In the event that a potential dispute arises between the Contractor and a Standardization Vendor, the Contract Administrator shall be notified.

D29. PAYMENT OF STANDARDIZATION VENDORS

D29.1 The Contractor is obligated to pay the Standardization Vendors in accordance with general terms of supply applicable to such Standardization Vendor.

D29.2 The Contractor's payment terms to the Standardization Vendor, in respect of Standardized PLC Control System and Motor Control Equipment identified in E4, include the following:

- (a) except as indicated in (b), payment shall be in Canadian funds net thirty (30) Calendar Days after shipment;
- (b) payment for motor control centres shall be in Canadian funds net thirty (30) Calendar Days and initiated based upon the following schedule:

- (i) upon approval of the Shop Drawings or forty (40) Calendar Days after the last comprehensive submittal, in the event that a response is not made to the submittal: twenty-five percent (25%) of the total value;
- (ii) upon delivery of the complete MCC along with all associated as-manufactured documentation: sixty percent (60%) of the total value; or
- (iii) in the event that the delivery is intentionally delayed, upon request by the Contractor, the following payment schedule would replace the sixty percent (60%) payment:
 - ◆ Upon completion of the FAT and delivery of all as-manufactured documentation to the Contractor – thirty percent (30%) of the total value.
 - ◆ Forty (40) Calendar Days after delivery of the as-manufactured documentation to the Contractor, or upon delivery, whichever comes sooner – thirty percent (30%) of the total value.
- (iv) upon successful commissioning and delivery of documentation or six (6) months after delivery, whichever comes first: fifteen percent (15%) of the total value.

D29.3 The Contractor's payment terms to the Standardization Vendor, in respect of Standardized Instrumentation identified in E5, include the following:

- (a) Payment shall be in Canadian funds net thirty (30) Calendar Days after receipt and approval of the Standardization Vendor's invoice.

WARRANTY

D30. WARRANTY

D30.1 Warranty is as stated in C13.

DISPUTE RESOLUTION

D31. DISPUTE RESOLUTION

D31.1 If the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator, the Contractor shall act in accordance with the Contract Administrator's opinion, determination or decision unless and until same is modified by the process followed by the parties pursuant to D31.

D31.2 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted".

D31.3 The entire text of C21.5 is deleted, and amended to read:

- (a) If Legal Services has determined that the Disputed Matter may proceed in the Appeal Process, the Contractor must, within ten (10) Business Days of the date of the Legal Services Response Letter, submit their written Appeal Form, in the manner and format set out on the City's Materials Management Website, to the Chief Administrative Officer, and to the Contract Administrator. The Contractor may not raise any other disputes other than the Disputed Matter in their Appeal Form.

D31.4 Further to C21, prior to the Contract Administrator's issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator ("Dispute"):

- (a) in the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor's equivalent representative to resolve Disputes within the normal course of project dealings between the Contract Administrator and the Contractor's equivalent representative; and
- (b) disputes which in the reasonable opinion of the Contract Administrator or the Contractor's equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process

consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:

- (i) the Contract Administrator;
- (ii) Supervisory level between the Contract Administrator and applicable Department Head; and
- (iii) Department Head.

- D31.5 Names and positions of Contractor representatives' equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.
- D31.6 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.
- D31.7 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.
- D31.8 If the Dispute is not resolved to the City and Contractor's mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D31.7, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

THIRD PARTY AGREEMENTS

D32. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

- D32.1 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.
- D32.2 Further to D32.1, in the event that the obligations in D32 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.
- D32.3 For the purposes of D32:
- (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.
- D32.4 Modified Insurance Requirements
- D32.4.1 If not already required under the insurance requirements identified in D13, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars (\$2,000,000.00) 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 their Ministers, officers, employees, and agents shall be added as additional insureds.
- D32.4.2 If not already required under the insurance requirements identified in D13, 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.

D32.4.3 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.

D32.4.4 Further to D13.3, 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.

D32.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D32.5 Indemnification By Contractor

D32.5.1 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.

D32.5.2 The Contractor agrees that in no event will Canada or Manitoba, their respective officers, servants, employees or agents be held liable for any damages in Contract, tort (including negligence) or otherwise, for:

- (a) any injury to any person, including, but not limited to, death, economic loss or infringement of rights;
- (b) any damage to or loss or destruction of property of any person; or
- (c) any obligation of any person, including, but not limited to, any obligation arising from a loan, capital lease or other long term obligation;

in relation to this Contract or the Work.

D32.6 Records Retention and Audits

D32.6.1 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.

D32.6.2 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 D32.6.1 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.

D32.7 Other Obligations

- D32.7.1 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.
- D32.7.2 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.
- D32.7.3 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.
- D32.7.4 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.
- D32.7.5 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.
- D32.7.6 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 D14)

KNOW EVERYONE 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. 718-2022

RIVERBEND LIFT STATION UPGRADES

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 D14)

KNOW EVERYONE 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. 718-2022

RIVERBEND LIFT STATION UPGRADES

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; and
- (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)

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 their 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:

| <u>Specification No.</u> | <u>Specification Title</u> |
|--------------------------|---|
| 00 01 10 | Table of Contents |
| Division 01 | General Requirements |
| 01 11 20 | Pre-Selected and Pre-Purchased Equipment |
| 01 33 00 | Submittal Procedures |
| 01 45 00 | Quality Control |
| 01 51 00 | Temporary Utilities |
| 01 52 00 | Construction Facilities |
| 01 56 00 | Temporary Barriers |
| 01 61 00 | Common Product Requirements |
| 01 73 00 | Execution |
| 01 74 00 | Cleaning |
| 01 74 19 | Waste Management and Disposal |
| 01 78 00 | Closeout Submittals |
| 01 79 00 | Demonstration and Training |
| 01 91 13 | Commissioning, Start-Up and Field Trial Operation |
| Division 02 | Existing Conditions |
| 02 41 16 | Structure Demolition |
| Division 04 | Masonry |
| 04 20 00 | Masonry |
| Division 05 | Metals |
| 05 12 23 | Structural Steel for Buildings |
| 05 31 00 | Steel Decking |
| 05 50 00 | Metal Fabrication |
| Division 06 | Woods, Plastic and Composite |
| 06 10 11 | Rough Carpentry |
| 06 17 53 | Shop Fabricated Wood Trusses |
| Division 07 | Thermal and Moisture Protection |
| 07 21 13 | Board Insulation |
| 07 21 16 | Blanket Insulation |
| 07 21 19 | Sprayed Foam Insulation |
| 07 26 00 | Air and Vapour Retarders |
| 07 61 00 | Metal Roofing System |

| <u>Specification No.</u> | <u>Specification Title</u> |
|--------------------------|---|
| 07 62 10 | Metal Siding Flashing and Trim |
| 07 92 10 | Joint Sealing |
| Division 08 | Openings |
| 08 11 14 | Metal Doors and Frames |
| 08 31 13 | Access Doors and Frames |
| 08 71 10 | Door Hardware |
| Division 09 | Finishes |
| 09 67 00 | Epoxy Coatings |
| 09 91 00 | Painting |
| Division 10 | Specialties |
| 10 44 20 | Fire Extinguishers |
| Division 21 | Mechanical |
| 21 05 01 | Common Results for Mechanical Work |
| 21 17 20 | Thermal Insulation for Piping |
| Division 22 | Plumbing |
| 22 05 00 | Common Work Results for Plumbing |
| 22 05 02 | Installation for Pipework – Plumbing |
| 22 05 93 | Test, Adjustment and Balance for Plumbing |
| 22 11 16 | Domestic Water Piping |
| 22 42 01 | Piping Specialties and Accessories |
| Division 23 | Heating, Ventilating and Air Conditioning (HVAC) |
| 23 05 00 | Common Work Results for HVAC |
| 23 05 53 | Mechanical Identification |
| 23 05 93 | Testing, Adjusting and Balancing for HVAC |
| 23 07 13 | Duct Insulation |
| 23 09 33 | Electric and Electronic Control System for HVAC |
| 23 31 13 | Metal Ducts and Dampers |
| 23 33 00 | Air Duct Accessories |
| 23 34 00 | HVAC Fans |
| 23 37 13 | Grilles, Registers and Diffusers |
| 23 37 20 | Louvres, Intakes and Vents |
| 23 44 00 | HVAC Air Filtration |
| 23 81 23.01 | Single Split Air Conditioning |
| 23 82 00 | Electric Heaters |
| Division 26 | Electrical |
| 26 05 00 | Common Work – Electrical |
| 26 05 20 | Wire and Box Connector |
| 26 05 21 | Wires and Cables |
| 26 05 28 | Grounding – Secondary |
| 26 05 29 | Hangers and Supports for Electrical Systems |
| 26 05 31 | Splitters, Junction, Pull Boxes and Cabinets |
| 26 05 32 | Outlet Boxes, Conduit Boxes and Fittings |
| 26 05 34 | Conduits, Conduits Fastening and Conduits Fitting |
| 26 05 36 | Cables Trays for Electrical Systems |
| 26 09 23 | Metering and Switchboard Instruments |
| 26 12 17 | Dry Type Transformers up to 600 V Primary |
| 26 24 17 | Panelboards Breaker Type |
| 26 24 19 | Motor Control Centres |
| 26 27 26 | Wire Devices |
| 26 28 21 | Molded Case Circuit Breakers |
| 26 28 23 | Disconnect Switches Fused and Non-Fused |
| 26 29 03 | Control Devices |
| 26 29 10 | Motor Starters to 600 V |
| 26 29 20 | Variable Frequency Drives |
| Division 29 | Instrumentation and Control |
| 29 05 00 | Common Work – Instrumentation and Control |
| 29 10 01 | Enclosures |
| 29 15 01 | Instrumentation Cable |

| <u>Specification No.</u> | <u>Specification Title</u> |
|--------------------------|---|
| 29 30 11 | Miscellaneous Panel Devices |
| 29 30 21 | Power Supplies |
| 29 40 01 | Control and Operator Interface Requirements |
| 29 40 51 | Remote Terminal Units |
| 29 50 01 | Instrumentation Specifications Sheet |
| 29 60 01 | Process Control Narrative Specifications |
| Division 31 | Earthwork |
| 31 23 33.01 | Excavating, Trenching and Backfilling |
| Division 33 | Yard Piping |
| 33 31 23 | Sanitary Sewerage Force Main Piping |
| Division 40 | Process Piping |
| 40 05 13 | Process Piping |
| 40 05 52 | Installation of Process Valves |
| Division 43 | Process Pumping |
| 43 21 13 | Installation of Centrifugal Pumps |

| <u>Drawing No.</u> | <u>Drawing Name/Title</u> |
|----------------------|---|
| 1-0178L-D0001 | 001 Cover Sheet |
| 1-0178L-D0002 | 001 Drawing Index |
| 1-0178L-D0003 | 001 Drawing Index |
| Civil | |
| 1-0178L-C0001 | 001 Civil Forcemain Plan-Profile |
| Architectural | |
| 1-0178L-B0001 | 001 Architectural Schedules |
| 1-0178L-B0002 | 001 Architectural Location and Demolition Plans |
| 1-0178L-B0003 | 001 Architectural Plan and Details |
| 1-0178L-B0004 | 001 Architectural Plans and Sections |
| 1-0178L-B0005 | 001 Architectural Roof Plan and Elevations |
| 1-0178L-B0006 | 001 Architectural Section and Details |
| Structural | |
| 1-0178L-S0001 | 001 Structural General Notes |
| 1-0178L-S0002 | 001 Structural Standard Details |
| 1-0178L-S0003 | 001 Structural Plans and Sections |
| 1-0178L-S0004 | 001 Structural Plan, Sections and Details |
| Process | |
| 1-0178L-P0001 | 001 Process and Instrumentation Diagram – HVAC System Flow |
| 1-0178L-P0002 | 001 Process and Instrumentation Diagram – Legend |
| 1-0178L-P0003 | 001 Process and Instrumentation Diagram – Wastewater Pumping |
| Mechanical | |
| 1-0178L-M0002 | 001 Mechanical HVAC and Plumbing – Demolition |
| 1-0178L-M0003 | 001 Mechanical Piping Plan Layout – Demolition |
| 1-0178L-M0004 | 001 Mechanical Piping Sections – Demolition |
| 1-0178L-M0005 | 001 Mechanical Plan Layout and Sections – HVAC and Plumbing |
| 1-0178L-M0006 | 001 Mechanical Details and General Notes |
| 1-0178L-M0007 | 001 Mechanical Piping Plans |
| 1-0178L-M0008 | 001 Mechanical Piping Sections |
| 1-0178L-M0009 | 001 Mechanical Piping Miscellaneous and Seal Water Piping Details |
| 1-0178L-M0010 | 001 Mechanical Equipment Schedules |
| 1-0178L-M0011 | 001 Mechanical Equipment Schedules |
| Electrical | |
| 1-0178L-E0001 | 001 Electrical Demolition Plan |
| 1-0178L-E0002 | 001 Electrical Single Line Diagram |
| 1-0178L-E0003 | 001 Grounding Installation Details |
| 1-0178L-E0004 | 001 Hazardous Classification Plans |
| 1-0178L-E0005 | 001 Electrical Power Plan Layout |
| 1-0178L-E0006 | 001 Electrical Lighting Plan Layout |
| 1-0178L-E0007 | 001 MCC Elevation and Details MCC-L71 |
| 1-0178L-E0008 | 001 Motor Starter Schematic Lift Pump P-L01 |

| <u>Drawing No.</u> | <u>Drawing Name/Title</u> |
|--------------------|---|
| 1-0178L-E0009 | 001 Motor Starter Connection Diagram Lift Pump P-L01 |
| 1-0178L-E0010 | 001 Motor Starter Schematic Lift Pump P-L02 |
| 1-0178L-E0011 | 001 Motor Starter Connection Diagram Lift Pump P-L02 |
| 1-0178L-E0012 | 001 Motor Starter Schematic and Connection Diagram Supply Fan SF-L66 |
| 1-0178L-E0013 | 001 Motor Starter Schematic and Connection Diagram Supply Fan SF-L67 |
| 1-0178L-E0014 | 001 Panel Layout and Bill of Material Temporary Load Bank Connection JB-L72 |
| 1-0178L-E0015 | 001 Lighting Control Details JBA-L84 |

Automation

| | |
|---------------|--|
| 1-0178L-A0001 | 001 Automation Plan Layout |
| 1-0178L-A0002 | 001 Panel Layout and Bill of Material Control Panel CP-L81 |
| 1-0178L-A0002 | 002 Panel Layout and Bill of Material Control Panel CP-L81 |
| 1-0178L-A0002 | 003 Panel Layout and Bill of Material Control Panel CP-L81 |
| 1-0178L-A0003 | 001 Network Diagram Control Panel CP-L81 |
| 1-0178L-A0004 | 001 Power Distribution Schematic Control Panel CP-L81 |
| 1-0178L-A0005 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0006 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0007 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0008 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0009 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0010 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0011 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0012 | 001 PLC I/O Wiring Diagram Control Panel CP-L81 |
| 1-0178L-A0013 | 001 Control Schematic Control Panel CP-L81 |
| 1-0178L-A0014 | 001 Panel Layout and Bill of Material Ventilation Panel |
| 1-0178L-A0015 | 001 Power Distribution Schematic Ventilation Panel |
| 1-0178L-A0016 | 001 Panel Layout and Bill of Material Junction Box JB-L82 |
| 1-0178L-A0017 | 001 Loop Diagram Entry Door Contact |
| 1-0178L-A0018 | 001 Loop Diagram Station Occupied Light Switch |
| 1-0178L-A0019 | 001 Loop Diagram HCE-L60 Main Floor Duct Heater |
| 1-0178L-A0020 | 001 Loop Diagram Main Floor Ventilation Dampers |
| 1-0178L-A0020 | 002 Loop Diagram Main Floor Ventilation Dampers |
| 1-0178L-A0021 | 001 Loop Diagram HCE-L68 Stairs Duct Heater |
| 1-0178L-A0022 | 001 Loop Diagram Wet Well Level Switch |
| 1-0178L-A0023 | 001 Loop Diagram Wet Well Level Switch |
| 1-0178L-A0024 | 001 Loop Diagram Flood Level Switch |
| 1-0178L-A0025 | 001 Loop Diagram Level Controller and Transmitter |
| 1-0178L-A0025 | 002 Loop Diagram Level Controller and Transmitter |
| 1-0178L-A0026 | 001 Loop Diagram Pump Room Seal Water Loss |
| 1-0178L-A0027 | 001 Loop Diagram Main Floor Supply Fan Air Filter Plugged Switch |
| 1-0178L-A0028 | 001 Loop Diagram Pump Room Seal Water Flow Switches |
| 1-0178L-A0029 | 001 Loop Diagram Lift Pumps P-L01 and P-L02 Discharge Flow Meter |
| 1-0178L-A0030 | 001 Loop Diagram MCC-L71 600 Power Fail Relay |
| 1-0178L-A0031 | 001 Loop Diagram MCC-L71 Surge Protection Device |
| 1-0178L-A0032 | 001 Loop Diagram Temperature Indicating Transmitter |
| 1-0178L-A0033 | 001 Loop Diagram Motor 1 Winding RTD |
| 1-0178L-A0034 | 001 Loop Diagram Motor 1 Winding RTD |
| 1-0178L-A0035 | 001 Loop Diagram Pump 1 Drive-End and Non-Drive-End Bearing RTD |
| 1-0178L-A0036 | 001 Loop Diagram Motor 2 Winding RTD |
| 1-0178L-A0037 | 001 Loop Diagram Motor 2 Winding RTD |
| 1-0178L-A0038 | 001 Loop Diagram Pump 2 Drive-End and Non-Drive-End Bearing RTD |
| 1-0178L-A0039 | 001 Loop Diagram Pump 1 Drive-End Bearing Vibration Sensor |
| 1-0178L-A0040 | 001 Loop Diagram Motor 1 DE and ODE Bearing Vibration Sensor |
| 1-0178L-A0041 | 001 Loop Diagram Pump 2 Drive-End Bearing Vibration Sensor |
| 1-0178L-A0042 | 001 Loop Diagram Motor 2 DE and ODE Bearing Vibration Sensor |
| 1-0178L-A0043 | 001 Loop Diagram Supply Fan SF-L66 and SF-L67 Low Flow Switches |

GENERAL REQUIREMENTS

E2. HAZARDOUS MATERIALS

- E2.1 If asbestos or other hazardous materials are encountered during the Work of the Contract, the Contractor shall stop all work and notify the Contract Administrator immediately. Removal of hazardous materials shall be dealt with by the City and the Contractor shall await further instruction by the Contract Administrator.

E3. CONTRACTOR SUPPLIED STANDARDIZED EQUIPMENT

- E3.1 Comply with the general requirements of E4 for all Standardized Goods supplied by the Contractor.
- E3.2 Comply with the following Standardization Goods requirements:
- (a) PLC Control System and Motor Control Equipment in accordance with E4; and
 - (b) Instrumentation in accordance with E5.
- E3.3 Contact the Contract Administrator regarding any potential uncertainty as to whether a good is covered under a standardization agreement.
- E3.4 The Contractor may utilize a Standardization Vendor to provide other goods required under the Contract, in addition to Standardized Goods.
- E3.5 The Contractor shall separately track all goods supplied under each standardization agreement.
- (a) In the event that one or more Standardization Vendors are utilized to procure goods not covered under a standardization agreement, the Contractor shall ensure such goods are quoted, ordered, tracked and accounted in a separate manner.
- E3.6 Pricing:
- (a) the City has obtained discounted pricing for Standardized Goods. Each Standardization Vendor is obligated to sell Standardized Goods to all prospective Contractors at the discounted price, provided the goods are for the City of Winnipeg;
 - (b) the Standardization Vendors may at their option provide lump sum pricing for goods packages. The Standardization Vendor is not required to provide breakout pricing details to the Contractor;
 - (c) the Contractor and Subcontractors shall not utilize the City's agreements with the Standardization Vendors for any purpose other than City work; and
 - (d) the City may audit the goods purchased from the Standardization Vendors under the standardization agreements and may identify to the Standardization Vendors any goods procured that are not associated with the Contract.
- E3.7 The Contractor is responsible for ensuring that the Material supplied by the Standardization Vendors meets the requirement of the Contract. The Contractor shall review and confirm quotations supplied by the Standardization Vendors to ensure that all required Material is supplied.
- E3.8 Without limiting or otherwise affecting any other term or condition of the Contract, including (non-exhaustive) D29.2(b):
- (a) the supply of goods through a Standardization Vendor shall not relieve the Contractor of their obligations;
 - (b) errors or omissions by a Standardization Vendor shall not be a cause for a Change in Work;

- (c) delays by a Standardization Vendor shall not be a cause for a Change in Work where the delay could have been avoided through reasonable planning, contingency allocation, or communication by the Contractor; and
- (d) the Contractor shall engage directly with the persons listed as the Standardized Vendor contact in sections E4.6 and E5.6 unless otherwise directed by the Contract Administrator.

E3.9 Submittals

- (a) Submittals shall be provided for Standardized Goods in accordance with the Specifications and typical industry practice. Submittals shall not be bypassed for Standardized Goods.

E4. STANDARDIZED PLC CONTROL SYSTEM AND MOTOR CONTROL EQUIPMENT

E4.1 The City has standardized on a specific vendor for the supply and delivery of control system and motor control equipment. The Standardization Vendor was selected via RFP 756-2013 and was awarded to Schneider Electric Canada Inc. (Schneider).

- (a) Refer to E4.6 for contact information.
- (b) Copies of the tender documents are available from City of Winnipeg Material Management's website.

E4.2 Goods to be procured via this standardization agreement and applicable to this Tender includes but is not limited to:

- (a) Programmable Controllers (PLCs) including all associated components, hardware and software;
- (b) Touchscreen HMI systems such as Magellis HMIs;
- (c) Motor Control Centers (MCCs) including all components; and
- (d) Variable Frequency Drives (VFDs) including all components.

E4.3 For clarity, this standardization agreement does not include:

- (a) computer workstation hardware including operating systems;
- (b) computer server hardware, including operating systems and general terminal server/client software;
- (c) thin client terminals;
- (d) fused and un-fused disconnect switches not incorporated into a MCC or other motor starters;
- (e) control stations and pendants not incorporated into a MCC or other motor starters;
- (f) Electrical Transformers not in a MCC or motor starter;
- (g) panelboards not integrated in a MCC;
- (h) Switchboards/Switchgear not integrated in a MCC;
- (i) System Integration Services (including programming and configuration);
- (j) Control Panels to house PLCs;
- (k) instrumentation;
- (l) power supplies not integrated with the PLC/HMI systems; and
- (m) terminal blocks not integrated with the PLC/HMI systems.

E4.4 The following model series shall be utilized unless otherwise indicated in the Specifications, Drawings or otherwise approved by the Contract Administrator:

- (a) Schneider Electric M580 PLC;
- (b) Schneider Electric X80 PLC I/O;
- (c) Schneider Electric EcoStructure Control Expert programming software;

- (d) Schneider Electric Local HMI – Harmony HMIGTO or HMIGTU series;
- (e) Schneider Electric Model 6 MCC – NEMA rated starters; and
- (f) Schneider Electric Altivar 600 series VFD drives.

E4.5 Commissioning and start-up:

- (a) Except as identified in (b), commissioning and start-up of all goods purchased under this standardization agreement shall be performed by the Contractor.
- (b) Schneider shall provide MCC start-up services, but not commissioning services. Coordinate with Schneider as required to understand the limitations of Schneider's MCC start-up services and provide all remaining testing, commissioning and start-up services to provide a complete commissioning and start-up.

E4.6 The contact information for all quotations and purchases from Schneider is:

Derrick Cook
Omands Creek Boulevard, Winnipeg, Manitoba, R2R 2V2
Telephone: (204) 218-1938
Email: Derrick.Cook@SE.com

E4.7 Goods to be procured via Choice Electric along with Eecol Electric, as Schneider's High Tech Automation Distributor (HTAD):

- (a) Further to E4.2, goods to be procured via Eecol includes but is not limited to:
 - (i) Programmable Controllers (PLCs) including all associated components hardware and software;
 - (ii) Programmable Controller Programming Software;
 - (iii) HMI System software;
 - (iv) Touchscreen HMI systems such as Magellis HMIs;
 - (v) Touchscreen HMI Programming Software;
 - (vi) Motor Control Centers including all components;
 - (vii) Loose VFDs, motor starters, soft starters, and associated components; and
 - (viii) Industrial Ethernet Switches as per design. Note that some Ethernet switches may be specified to be from other vendors due to application requirements. Refer to Drawings and Specifications.

(b) The Eecol Electric contact:

Trevor Hambleton
1760 Wellington Avenue, Winnipeg, Manitoba, R3H 0E9
Telephone: (204) 774-2800
Email: hambleton@eecol.com

(c) The Choice Electric contact:

Ofer Margovski
2130 Notre Dame Avenue, Winnipeg, Manitoba, R3H 0K1
Telephone: (204) 783-2333
Email: oferm@choicesupply.ca

- (d) All correspondence related to requests-for-quotations to the Supplier for goods listed under (a) shall be copied to the Schneider contact listed under E4.6.
- (e) For whatever reason, if the Supplier is unable to receive or respond to request-for-quotations for goods listed under (a) request-for-quotations may be issued directly to the Schneider contact listed under E4.6.

E4.8 Quotations and orders:

- (a) Reference the following in all quotation requests and purchase orders:

- (i) this Tender Chonumber; and
- (ii) a statement indicating: "This request/purchase order is subject to the Terms and Conditions of City of Winnipeg Request for Proposal RFP 756-2013."

E4.9 Measurement and Payment:

- (a) Payment will be based on Form B, Item 19.
- (b) Indicate base costs for material supply under the standardization agreement. Any material mark-up or installation costs, as applicable, shall be included in other line items of Form B.

E5. STANDARDIZED INSTRUMENTATION

E5.1 The City has standardized on a specific vendor for the supply and delivery of specific instrumentation. The Standardization Vendor was selected via RFP 449-2014 and was awarded to Trans-West Supply Company Inc. (Trans-West).

- (a) Copies of the tender documents are available from City of Winnipeg Material Management's website.

E5.2 Goods to be procured via this standardization agreement and applicable to this Tender include but are not limited to:

- (a) Temperature Transmitters including temperature elements and thermowells;
- (b) Electromagnetic Flowmeter Transmitters;
- (c) Differential Pressure (Level) Transmitters; and
- (d) Associated accessories.

E5.3 For clarity, this standardization agreement does not include:

- (a) Flowmeters – Coriolis;
- (b) Flowmeters – Thermal Dispersion;
- (c) Flowmeters – Ultrasonic;
- (d) Flow switches (i.e., mechanical);
- (e) Pressure switches;
- (f) Temperature switches;
- (g) Radar Level Transmitters; and
- (h) Level Switches (non-ultrasonic based).

E5.4 The following model series shall be utilized unless otherwise indicated in the Specifications, Drawings or otherwise approved by the Contract Administrator:

- (a) Temperature Transmitters:
 - (i) Siemens SITRANS TF (Process Applications); and
 - (ii) Siemens SITRANS TH300 (HVAC applications).
- (b) Electromagnetic Flowmeter Transmitters:
 - (i) Siemens SITRANS F M MAG 5100W series flow sensor (Process Applications);
 - (ii) Siemens SITRANS F M MAG 6000 series transmitter (Process Applications);
 - (iii) Siemens Remote Wall Mount Kit FDK:085U1053; and
 - (iv) Siemens Cable Kit.
- (c) Differential Pressure (Level) Transmitters:
 - (i) Siemens SITRANS P DS III (Process Applications).

E5.5 Field setup and commissioning:

- (a) Field setup and commissioning of the instrumentation may be performed by Trans-West under the Standardization Agreement. Coordinate with Trans-West as required to understand the capabilities and limitations of Trans-West's field setup and commissioning services and provide all remaining services to provide a complete commissioning and startup.
- (b) Field setup and commissioning of the standardized instrumentation shall be performed by Trans-West under the standardization agreement for the following:
 - (i) the first instrument of each type installed on-Site; and
 - (ii) a minimum of five (5) additional instruments of each type, or ten percent (10%) of the actuators of that type, whichever is greater.

E5.5.1 The Contractor may provide field setup and commissioning services for the remaining instrumentation via alternate means, provided that this does not result in a reduction of the services or quality of Work.

E5.5.2 The services provided are to include at all standard manufacturer recommended start-up and commissioning procedures, as well as the following:

- (a) Visual Inspection:
 - (i) inspect instrument for signs of damage;
 - (ii) verify mechanical and piping installation per Drawings and manufacturer requirements;
 - (iii) verify wiring installation per Drawings and manufacturer requirements; and
 - (iv) inspect electrical terminal compartment for foreign objects;
- (b) Mechanical Inspection:
 - (i) check all connections and bolts for tightness and to the correct torque;
 - (ii) check for alignment; and
 - (iii) ensure appropriate clearances for all connecting bushings and connecting faces;
- (c) Electrical Inspection:
 - (i) check all power wiring connections for tightness;
 - (ii) check all fuses in the instrument for continuity;
 - (iii) confirm input voltage is correct; and
 - (iv) confirm that the signal/fieldbus connections are correct;
- (d) Start-up Services:
 - (i) coordinate turning on power to the instrument;
 - (ii) configure all applicable settings and parameters that could not be configured prior to installation;
 - (iii) perform functional tests;
 - (iv) coordinate with City personnel and designated representatives to confirm and finalize the application requirements;
 - (v) configure and document all settings, as appropriate for the application;
 - (vi) coordinate to perform test demonstrations to verify instrument performance;
 - (vii) verify that all configuration values are in the correct state; and
 - (viii) transfer the configuration settings to on-Site personnel;
- (e) Documentation:
 - (i) provide a signed documented commissioning form for each instrument, in a format acceptable to the Contract Administrator;
- (f) Travel:
 - (i) provide all travel and accommodations at no additional cost;
- (g) Personnel:

- (i) personnel shall be factory trained in the maintenance, configuration and service of the proposed instrumentation.

E5.5.3 Responsibility of the Contractor:

- (a) It is the responsibility of the Contractor to ensure that the installation of the instrumentation is complete and that the instrument is ready to commission prior to engaging Trans-West to commission any instrumentation.

E5.6 The contact for all quotations and purchases:

Amurthan (Amu) Abimanan, Branch Manager
126 Bannister Road, Winnipeg, Manitoba, R3R 0S3
Telephone: (204) 783-0100
Mobile: (204) 782-1864
Email: amu@transwest-mb.com

E5.7 Quotations and orders:

- (a) Reference the following in all quotation requests, quotations/proposals, purchase orders and invoices:
 - (i) this Tender number; and
 - (ii) a statement indicating: "This request/purchase order is subject to the Terms and Conditions of City of Winnipeg Request for Proposal RFP 449-2014."

E5.8 Measurement and Payment:

- (a) Payment will be based on Form B, Item 20.
 - (i) Indicate base costs for material supply under the standardization agreement. Any material mark-up or installation costs, as applicable, shall be included in other line items of Form B.

E6. MOBILIZATION AND DEMOBILIZATION PAYMENT

E6.1 Description

- (a) It is intended that this Specification cover all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E6.2 Scope of Work

- (a) The Work under this Specification shall include, but not be limited to:
 - (i) submission of Site layout plan;
 - (ii) mobilizing and demobilizing on-Site Work facilities;
 - (iii) supplying, setting up, laying out and removing Site office facilities;
 - (iv) install, maintaining and removing any access roadway; and
 - (v) traffic control and traffic management.

E6.3 References

- (a) Mobilization and demolition are in accordance with the most recent *Standard Construction Specifications*:
 - (i) CW 1120 – Existing Services, Utilities and Structures; and
 - (ii) CW 1130 – Site Requirements.

E6.4 Submittals

- (a) The Contractor shall submit the following to the Contract Administrator fourteen (14) days prior to mobilization on-Site, a plan highlighting the Site layout plan which includes; laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits and gate locations for review and approval.
- (b) Contractor shall refer to the Drawings for limits of construction.

E6.5 Materials and Equipment

- (a) All Materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (b) The Contractor shall be responsible for the supply, safe storage, and handling of all Materials as set forth in this Specification. All Materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E6.6 Construction Methods

- (a) Site Inspection:
 - (i) inspect the Site with the Contract Administrator to verify existing conditions prior to mobilizing on-Site; and
 - (ii) inspect the Site with the Contract Administrator soon after demobilizing on-Site, confirming Site has been restored to its original condition prior to initiation of Work;
- (b) Layout of On-Site Work Facilities:
 - (i) the Contractor shall mobilize all on-Site Work and other temporary facilities; and
 - (ii) upon completion of construction activities, the Contractor shall remove all on-Site Work and other temporary facilities;
- (c) Cellular Telephone Communication:
 - (i) the Contractor's Site supervisor is required to carry, at all times, a cellular telephone, with voicemail;
- (d) Access Roadway:
 - (i) the Contractor shall maintain any access roadway they install;
 - (ii) the access road shall be maintained on a regular basis to provide continual unrestricted Site access, to the satisfaction of the Contract Administrator; and
 - (iii) upon completion of the Work, the area shall be restored to its original condition;
- (e) Snow and Ice Removal:
 - (i) if required, snow clearing shall be done by the Contractor on a regular basis; and
 - (ii) if required, snow cover shall be cleared from the construction Site prior to commencement of the Work. The methodology to clear the snow shall be subject to the approval of the Contract Administrator;
- (f) Restoration of Existing Facilities:
 - (i) upon completion of the Work and demobilization, the Contractor shall restore existing facilities to their original condition, including snow removal, to the approval of the Contract Administrator.

E6.7 Measurement and Payment

- (a) Mobilization and demobilization will be measured on a lump sum basis at the Contract Unit Price for "Mobilization and Demobilization" as shown in Form B: Prices, for supplying all Materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) Mobilization and demobilization will be paid for at a percentage of the Contract lump sum Prices, as specified herein. These percentages shall be as follows:

- (i) thirty percent (30%) when Contract Administrator is satisfied that construction has commenced;
- (ii) fifty percent (50%) during construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator; and
- (iii) twenty percent (20%) upon completion of the Work.

E7. ADDITIONAL WORK

- E7.1 Additional Work may be necessitated due to unforeseen circumstances that may arise during the course of the project due to:
- (a) Additions to the scope of Work by the Contract Administrator, beyond that defined herein.
- E7.2 A cash allowance has been included as “Extra Work Allowance” on Form B: Prices.
- E7.3 The City reserves the right to delete any or all of the Cash Allowance from the Contract if the Work intended to be covered by the Cash Allowance is not required, or if the Works intended are found to be more extensive than the provisional Cash Allowance.
- E7.4 Cost of additional work shall be evaluated by the methods outlined in C7.4, and a Change Order prepared by the Contract Administrator. Cost of the Change Order will be paid on the Progress Estimate and deducted from the Cash Allowance. If the valuation of the authorized work exceeds the Value of the Cash Allowance, the Contract Value will be adjusted by the shortfall.
- E7.5 Additional services and/or Work will not be initiated for:
- (a) reasons of lack of performance or errors in execution; and
 - (b) scheduling changes initiated by the City, where at least twenty-four (24) hours’ notice is given prior to the Contractors schedule time to be on Site.
- E7.6 Should it be determined that additional material or services are required, the Contract Administrator shall approve the Work, prior to commencement of the additional Work.
- E7.7 Material Mark-Up Factors:
- (a) The base cost is to be the wholesale cost of the material, regardless of the Contractor or Subcontractor supplying the material.
 - (b) In general, the party (Contractor or Subcontractor) supplying the material is the party that purchases the material from a supplier who does not perform any work on Site, unless otherwise determined by the Contract Administrator.
 - (c) Where the Contractor is supplying the material, the mark-up on the material is limited to fifteen percent (15%).
 - (d) Where a Subcontractor is supplying the material, the total mark-up on the material, including all Subcontractors and the Contractor is limited to twenty-five percent (25%), including the Contractor and all Subcontractors’ mark-ups.
 - (e) Where the Contractor’s immediate Subcontractor is supplying the material:
 - (i) the Subcontractor’s mark-up on the material is limited to fifteen percent (15%); and
 - (ii) the Contractor’s mark-up on the material is limited to ten percent (10%).
 - (f) A Third-Level Subcontractor is a Subcontractor of a Subcontractor of the Contractor.
 - (i) No Third-Level Subcontractors on this project are approved for additional mark-up.
 - (ii) In the event that a Third-Level Subcontractor is utilized, that is not approved for additional mark-up, the Contractor is responsible for coordinating the split of the maximum approved mark-up between the Contractor and Subcontractors.

E8. TRAFFIC CONTROL

- E8.1 In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contract Administrator shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place, maintain, and remove all regulatory signs and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:
- (a) parking restrictions;
 - (b) stopping restrictions;
 - (c) turn restrictions;
 - (d) diamond lane removal;
 - (e) full or directional closures on a Regional Street;
 - (f) traffic routed across a median;
 - (g) full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure; and
 - (h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.
- E7.2 Further to E8.1(c), the Contractor shall make arrangement with the Traffic Services Branch of the City of Winnipeg to supply regulatory signs as required.
- E7.3 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the Site has been maintained.
- E7.4 Further to E8.1(c) and E8.1(d) the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the Contract Work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.
- E7.5 Any changes to the approved traffic management plan must be submitted to the Contract Administrator a minimum of five (5) Working Days prior to the required change for approval.
- E8.2 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this Specification, Traffic Services Branch may be engaged to perform the Traffic Control. In this event the Contractor shall bear the costs associated charged to the project by the Traffic Services Branch of the City of Winnipeg in connection with the required Works undertaken by the Contractor.

E9. WATERWAY BY-LAW

- E9.1 The Contractor shall note that all Works within one hundred seven (107) metres (three hundred fifty (350) feet) of a riverbank are within the jurisdiction of the Waterway By-Law. The Contractor, if required, will apply and pay for any Waterway Permits for the Work. The Contractor shall adhere to restrictions imposed on the permit.
- E9.2 Under no circumstances will stockpiling of any Material be permitted within one hundred seven (107) metres (three hundred fifty (350) feet) of a riverbank or dike.

E10. TEMPORARY USE OF CITY EQUIPMENT

- E10.1 City facilities, systems and equipment shall not be used during construction without the Contract Administrator's written permission. The Contract Administrator reserves the right to withdraw said permission if, in his opinion, proper care and maintenance are not provided.

E11. WET WELL CLEANOUT

- E11.1 Clean out the wet well, initially to inspect the overall condition of the wet wells and dividing wall, and throughout the duration of the Work to maintain a clean wet well and prevent debris from entering the pumps upon initial start-up.
- E11.2 Clean out shall be performed by mechanical or manual methods and shall remove grit, tallow and other buildup to the satisfaction of the Contract Administrator.
- E11.3 The current level of accumulation in the wet well is not known. Higher levels of accumulation, above that anticipated by the Contractor, will not be eligible for additional payments.
- E11.4 Schedule upstream Work that may produce debris prior to wet well cleanout.
- E11.5 All construction Material and debris are to be removed from the wet well after completing the Works and prior to station start-up and commissioning.
- E11.6 The Contractor shall be responsible to maintain a clean wet well during construction.
- E11.7 Provide evidence of the wet well clean out in the form of photographs, or other suitable means, acceptable to the Contract Administrator.
- E11.8 Costs for clean out of wet well shall be considered incidental to the Work and no additional payment will be made beyond the amount indicated for Form B.
- E11.9 Under no circumstances will the City pay for more than one (1) clean out of the wet well. In the event that the areas are not clean at the end of the associated mechanical Work, the Contractor is responsible for bearing the cost of re-cleaning.

E12. EXISTING PUMPING STATION OPERATION DURING CONSTRUCTION

- E12.1 The facility related to the Work is critical to the transport of wastewater for the City of Winnipeg. Under no condition shall the station pumping be shut down without prior permission from the Contract Administrator.
- E12.2 The Contractor is advised that the pumping station will be allowed to be taken out of operation only after the Contractor's schedule of activities to complete the Work is approved by the Contract Administrator. The Contractor shall plan his construction activities to allow for the minimum amount of disruption time to normal operating status of the station.
- E12.3 The Contractor shall cooperate with and provide full access at all times for City personnel to carry out maintenance and operational duties.
- (a) No additional payments will be made for providing access to City forces on the Site or any potential affect City crews might have on the Contractor's Work.

E13. TEMPORARY SHUTDOWN OF THE PUMPING STATION

- E13.1 Temporary shutdown of the pumping station will be allowed for the following Work activities:
- (a) construction of by-pass manhole and valve assembly;
- (b) removal of existing suction and discharge piping, valves and fittings inside the pumping station;
- (c) supply and installation of new suction and discharge piping, valves, and fittings inside the pumping station; and
- (d) switch-overs between station pumps and temporary by-pass pumps.
- E13.2 Sequence Work such that a minimum amount of shutdown time at the pumping station is used for the above-mentioned activities.

- E13.3 All shutdowns must be reviewed and approved by the Contract Administrator prior to the shutdown. Prepare and submit shutdown plans to the Contract Administrator a minimum of forty-eight (48) hours prior to the proposed shutdown.
- E13.4 Operation of all City-owned equipment (e.g., gate valves) will be by the City unless prior approval is given to the Contractor.
- E13.5 The Contractor shall monitor the upstream system at all times to ensure the stored level of wastewater will not exceed the critical basement elevation. This elevation will be provided to the Contractor.
- E13.6 Schedule Work activities requiring shutdown of pumping operations to be done at night, if required by the Contract Administrator, when flow amounts are generally reduced, to maximize the amount of shutdown time available and reduce the risks associated with pumping station shutdown.
- E13.7 Schedule several Work activities to be completed in the same shutdown where possible to minimize the number of pumping station shutdowns and amount of temporary by-pass pumping required.
- E13.8 The Contractor shall provide a duty operator to operate the temporary pumping for wastewater diversion twenty-four (24) hours a day at no extra cost.
- E13.9 Temporary by-pass pumping, as described in E14, must be installed and operational at all times during construction and ready to be put into service if liquid level in the sewer system reaches the critical basement elevation shown on the Drawings or as determined by the Contract Administrator.
- E13.10 Water and Waste Department, Collection System personnel will be available to provide assistance to the Contractor for temporary shutdown of the pumping operations to facilitate completion of the Work.
- E13.11 There will be no charge to temporarily shut down the wastewater pumping station to facilitate completion of the Work.
- E13.12 If an unreasonable number of pumping station shutdowns are required to complete the Work due to the Contractor's method of operation, a fee of three hundred dollars (\$300.00) per hour for Collection System personnel may be charged to the Contractor and deducted from future Progress Payments.
- E13.13 The Contract Administrator reserves the right to cancel a planned pumping station shutdown if in his/her opinion, flow conditions or the weather forecast would not allow for a shutdown of sufficient duration to complete the Work activity. The Contractor shall reschedule the Work activity to a more suitable time.
- E13.14 Consecutive back-to-back pumping station shutdowns will not be allowed until the sewer system has returned to normal.

E14. FLOW CONTROL: PERMANENT BY-PASS MANHOLE AND TEMPORARY BY-PASS PUMPING

E14.1 Description

- E14.1.1 This section specifies the construction of a permanent by-pass manhole and valve assembly and the requirements for the temporary diversion of wastewater during construction and commissioning of the by-pass manhole and valve assembly and pumping station. The wastewater being diverted is raw un-screened sewage.
- E14.1.2 The expected minimum peak dry weather flow (PDWF) to the Station is one hundred fifty-four (154) litres per second (L/s) (two thousand four hundred forty (2,440) gallons per minute (GPM)).

- (a) Contractor to check and verify the critical basement elevation in the catchment area.
- (b) Combined sewers can receive flow of an undetermined amount from watermain breaks, snow melt, rain and other unforeseen sources. The Contractor will be responsible to monitor the flow in the sewer and adjust or halt Work activities accordingly due to unforeseen flow above the amount identified for PDWF.

E14.2 Materials and Equipment

E14.2.1 Temporary By-Pass Pumping Equipment

- (a) Non-clog, submersible pumping units, each sized to meet or exceed the required capacity. Complete with all required piping, fittings, floats, alarms, back-up generator, pump controls, and related appurtenances suitable for temporary installation in a Municipal Gate Chamber upstream of the pumping station.
- (b) Duty pump and stand-by pump(s) to each provide one hundred fifty-four (154) L/s at 12.4 metres total dynamic head (TDH) (two thousand four hundred forty (2,440) GPM at 40.1 feet TDH). Pumping system shall operate in parallel to provide greater flow if required.
- (c) Pumps to operate in lead-lag configuration.
- (d) Provide model and capacity curves to the Contract Administrator for approval.
- (e) Power supply to be suitably sized for pumping equipment complete with all required controls. Fuel to be in lockable, tamperproof container, approved by Contract Administrator.

E14.2.2 Fittings and Appurtenances

- (a) Fittings, couplings, and appurtenances to be used for repairs to existing forcemains and sewers to be approved products for underground use in the City of Winnipeg.
- (b) Fittings shall be sized to accommodate single pump operation and parallel pump operation. Contractor to provide pipe sizing and fittings for hydraulic review by the Contract Administrator.
- (c) Acceptable Manufacturers:
 - (i) Romac; or
 - (ii) Approved equal in accordance with B7.

E14.2.3 Bedding and Backfill

- (a) Bedding and initial backfill Material to be sand in accordance with CW 2030.
- (b) Backfill excavations in pavement areas to be Class 3 in accordance with Clause 3.8.3 of CW 2030. Backfill in excavations in boulevard areas to be Class 5 in accordance with Clause 3.8.5 of CW 2030.

E14.2.4 By-Pass Manhole and Valve Assembly

- (a) One (1) by-pass manhole assembly shall be installed immediately north of the pumping station in line with the proposed force main to allow by-pass pumping operations to take place when required. This manhole assembly shall be a pre-cast box section and shall include the installation of a gate valve upstream of the by-pass tees in the manhole.
- (b) One (1) three hundred fifty (350) millimetres (mm) by three hundred fifty (350) mm by two hundred fifty (250) mm tee fittings with a two hundred fifty (250) mm gate valve shall be installed on the forcemain as shown on the Civil Drawings, and is to be used for discharging wastewater flows during the by-pass pumping operations.
- (c) The following items shall be installed by the Contractor, and are shown on respective Drawing:
 - (i) one (1) three hundred fifty (350) mm rising stem gate valves and one (1) two hundred fifty (250) mm non-rising stem gate valves. Gate valves are to be provided by City of Winnipeg; and

- (ii) precast reinforced one thousand eight hundred (1,800) by one thousand two hundred (1,200) mm concrete box section to City of Winnipeg SD-010.

E14.2.5 Pumps Controls

- (a) Control system complete with float switches for automatic level control and manual start/stop ability.
- (b) Temporarily connect existing RTU control panel to new pump controls to monitor a high level alarm and loss of utility power.

E14.2.6 Backup Power

- (a) Provide a portable generator to provide backup power in the event of a utility failure. Switching to generator and back to utility shall be a manual transfer switch.

E14.3 Construction Methods

E14.3.1 General

- (a) Maintain level of sewage in existing sewers below the critical basement elevation at all times. The Contract Administrator will provide a mark at a convenient location for reference.
- (b) Contractor must monitor the upstream system at all times to ensure the stored level of wastewater does not exceed the critical basement elevation.
- (c) Provide a flow control plan to the Contract Administrator for review before construction starts.
- (d) Diversion of wastewater flow directly or indirectly to the environment, Land Drainage Sewers or Storm Relief Sewers will not be allowed.

E14.3.2 By-Pass Manhole Construction

- (a) The Contractor shall be responsible to obtain all necessary permits from the concerned offices/agencies in regard to the construction of the by-pass manhole and valve assembly. The Contractor will satisfy all permits and application requirements including any testing (e.g., geotechnical, etc.) if required to obtain the permit at no extra cost.
- (b) Survey and locate all existing services and limits of proposed manhole excavation relative to existing structures. The Contractor shall provide all survey and layout Work necessary to accurately layout and position the new construction. The Contract Administrator, at their sole discretion, may undertake a confirmatory survey of the Contractor's Work if considered necessary.
- (c) Design, supply, and install shoring system necessary for opening the new excavation to the required depth and dimensions necessary to install the new manhole assembly.
- (d) All excavations within 1.5 metres of sewers to be soft dug, either hydro excavated or by hand, as necessary to avoid potentially damaging the existing sewers.
- (e) Any service interruption shall conform to E13.

E14.3.3 Excavation Security Fence

- (a) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a security fence to completely surround the excavation when unattended in accordance with the following:
 - (i) security fence shall be chain link fence or approved equal, a minimum 1.80 metres high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse;
 - (ii) attach fencing securely to posts;
 - (iii) secure the gate or end of the fencing to a post with chain and a padlock; and
 - (iv) provide alternate security fence proposal to Contract Administrator for approval.

E14.3.4 Restoration

- (a) Restore the disturbed area and surface during construction to match the existing surroundings as per the City requirements and applicable standards.

E14.3.5 Temporary By-Pass Pumping

- (a) Temporary by-pass pumping can be installed at the Municipal Gate Chamber during:
 - (i) construction of by-pass manhole and valve assembly (if necessary); and
 - (ii) pumping station upgrades.
- (b) Once by-pass manhole and valve assembly is in operation, sewage can be pumped from the Municipal Gate Chamber to the by-pass tee during pumping station shutdown.
- (c) Provide detailed information for pumping equipment to be used including pump capacity and dimensions, depth of submergence, pump controls and installation details to the Contract Administrator for review before construction starts.
- (d) Power supply to be approved by the Contract Administrator before set-up. Locate the power supply where it will not adversely affect local residences. Location to be approved by the Contract Administrator before construction starts.
- (e) Provide suitable traffic ramps approved by the Contract Administrator if the by-pass pumping discharge pipe and power supply cables are laid across vehicle or pedestrian traffic areas.
- (f) Provide a check valve on the by-pass pumping discharge pipe to prevent cycling when the pumping station is activated.
- (g) The Contractor is advised that the pumping station will remain in service while the Work is being completed, except for planned temporary shutdowns as described in E13. The Contractor shall cooperate and coordinate with the City to allow full access at all times for City staff to carry out maintenance and operational duties.
- (h) If a temporary pump in use fails, it must be replaced immediately.
- (i) The Contractor shall ensure temporary by-pass pumping equipment and Materials will be properly insulated and heated, if required, to be protected from freezing and to maintain proper functioning during cold weather.
- (j) Under no circumstances can any wastewater sewage be discharged to the river.
- (k) Temporary by-pass pumping equipment and Materials shall remain on-Site until the pumping station construction is completed as described in these Specifications and to the satisfaction of the Contract Administrator.
- (l) Under no circumstances shall wastewater levels in the sewer rise above the critical basement elevation.

E14.4 Measurement and Payment

E14.4.1 Flow control and temporary by-pass pumping will be measured on a lump sum basis at the Contract Unit Price for "Flow Control and Temporary Wastewater Diversion and Dispersal" as shown in Form B: Prices, installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E14.4.2 By-pass manhole and valve assembly construction will be measured on a lump sum basis at the Contract Unit Price for "By-Pass Manhole and Valve Assembly" as shown in Form B: Prices, installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E14.4.3 A maximum of ninety-five percent (95%) may be submitted for progress payments prior to the total completion of the associated services, including the provision of As-Built Drawing mark-ups and O&M Manuals.

E15. WET WEATHER FLOWS IN EXISTING SEWER

- E15.1 In the event the flow in the sewer system is expected to exceed the amount indicated for PDWF due to wet weather run-off, the Contract Administrator may suspend Work activities that require temporary by-pass pumping and temporary shutdown of the pumping station. Suspension of these activities will continue until the high flow diminishes in the sewer system.
- E15.2 In the opinion of the Contract Administrator, if suspension of Work activities that require temporary by-pass pumping and temporary shutdown of the pumping station cause a delay in completion of the Work through no fault of the Contractor, the completion date of the Work will be adjusted accordingly.
- E15.3 There shall be no claim for additional costs or time due to the pumping station shutdowns from high wet weather flows.

E16. PRE-CAST CONCRETE RECTANGULAR BOX SECTION

- E16.1 Description
- (a) Notwithstanding and in addition to CW 2130, it is intended that this Specification cover the supply and installation of Pre-Cast Rectangular Box Section as shown on the Drawings.
- E16.2 Materials
- (a) Notwithstanding CW 2130 Clause 2.7 and City of Winnipeg Standard Detail SD-010, the supplied chamber shall be one thousand eight hundred (1,800) mm by one thousand two hundred (1,200) mm Pre-cast Concrete Rectangular Box Section including the base and top.
- E16.3 Construction Methods
- (a) The Construction Methods shall be as per Clause 3.8 of CW 2130.
- E16.4 Measurement and Payment
- (a) Pre-cast Rectangular Box Section will be measured on a lump sum basis at the Contract Unit Price for "Pre-cast Rectangular Box Section" as shown in Form B: Prices, installed and including all accessories for each catch basin in accordance with this Specification, accepted and measured by the Contract Administrator.

E17. REGULATORY APPROVALS AND PERMITS

- E17.1 Description
- (a) The Contractor shall be responsible to obtain all regulatory approvals and permits required to execute and complete the specified scope of Work. It will include:
- (i) Identification of the approvals and permits required, preparing and submitting applications, satisfying all requirements of the applications, performing any testing including geotechnical if required and payment of the fees at no extra cost.

E18. STRUCTURAL CONCRETE

- E18.1 Description
- (a) It is intended that this Specification cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete Works as specified herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E18.2 Scope of Work

- (a) The Work under this Specification shall include:
- (i) supplying and placing structural concrete for structural foundation wall; and
 - (ii) supplying and placing structural concrete for structural slab.

E18.3 Submittals

E18.3.1 General

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

E18.3.2 Concrete Mix Design Requirements

- (a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).
- (b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes and may be used as information related to supplementary testing and investigation of suspected defective concrete. The City of Winnipeg will advise the supplier if the information needs to be released to third parties. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:
- (i) cementitious content in kilograms per cubic metre or equivalent in accordance with B7, and type of cementitious Materials;
 - (ii) designated size, or sizes, of aggregates, and the gradation;
 - (iii) aggregate source location(s);
 - (iv) weights of aggregates in kilograms per cubic metre or equivalent in accordance with B7. Mass of aggregates is saturated surface dry basis;
 - (v) maximum allowable water content in kilograms per cubic metre or equivalent in accordance with B7, and the water/cementitious ratio;
 - (vi) the limits for slump;
 - (vii) the limits for air content; and
 - (viii) quantity of other admixtures.
- (c) The concrete mix design statements must be received by the Contract Administrator a minimum of fourteen (14) Calendar Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.
- (i) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance to CSA A23.1.
 - (ii) Any change in the constituent Materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the

Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

E18.3.3 Concrete Mix Design Test Data

(a) Concrete

- (i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.
- (ii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into the form. At the discretion of the Contract Administrator, if the Contractor can demonstrate a relationship between the plastic concrete properties at the point of discharge into the formwork and the end of the chute of the delivery truck, the Contract Administrator may accept test results at the end of the chute with the appropriate adjustments to the wet concrete performance requirements as being representative of what is in the formwork.

E18.3.4 Aggregates

- (a) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.
- (b) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.
- (c) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.
- (d) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.
- (e) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of one hundred (100) to one hundred twenty (120).
- (f) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of small-size, large-size coarse aggregates by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A, and A23.2-17A, respectively.
- (g) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

E18.3.5 The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E18.3.6 Notification of Ready Mix Supplier

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

E18.3.7 Temporary False Work, Formwork and Shoring Works

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including falsework, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.
- (b) Design Requirements:
 - (i) all forms shall be of wood, metal, or other Materials as approved by the Contract Administrator;
 - (ii) the falsework, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. Falsework shall be designed according to the requirements of CSA S269.1, "Falsework and formwork." The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring;
 - (iii) the falsework, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.1. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval;
 - (iv) the loads and lateral pressures outlined in "Guide to formwork for concrete", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in the above reference shall apply;
 - (v) as a minimum, the following spacing's shall apply for studding and walers:
 - ◆ twenty (20) mm plywood: studding four hundred (400) mm centre to centre (max.); and
 - ◆ walers seven hundred and sixty (760) mm centre to centre (max.);
 - (vi) forms shall be designed and constructed so that the completed Work will be within minus three (3) mm or plus six (6) mm of the dimensions shown on the Drawings;
 - (vii) formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads;
 - (viii) slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator;
 - (ix) shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required;
 - (x) mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores

- must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground;
- (xi) shores shall be braced horizontally in two (2) directions and diagonally in the same two (2) vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected;
 - (xii) all exposed edges shall be chamfered twenty (20) mm unless otherwise noted on the Drawings;
 - (xiii) formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings; and
 - (xiv) forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.
- (c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of Materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on-Site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. Falsework must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.
 - (d) For timber formwork and falsework, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E18.4 Materials

E18.4.1 General

- (a) All Materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (b) The Contractor shall be responsible for the supply, safe storage and handling of all Materials as set forth in this Specification. All Materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E18.4.2 Handling and Storage of Materials

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

E18.4.3 Concrete

- (a) Concrete Materials susceptible to frost damage shall be protected from freezing.
- (b) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in Table E13.1.

| TABLE E13.1 REQUIREMENTS FOR HARDENED CONCRETE | | | | | |
|---|---------------------------------------|---|--------------------------|-----------------------------|---------------------------|
| Type of Concrete | Location | Nominal Compressive Strength (MPa) | Class of Exposure | Air Content Category | Max Aggregate Size |
| Type 1 | Concrete Repair and Housekeeping Pads | 36 at 28 Days | C-1 | 1 | 19 mm |

E18.4.4 Aggregates

(a) General

- (i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of Materials. The two (2) sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign Materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, Material shall not be removed from the stockpile within one hundred fifty (150) mm of the ground level. This Material shall remain undisturbed to avoid contaminating the aggregate being used with the ground Material.
- (ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A. Current (less than eighteen (18) months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-25A is required.
- (iii) Petrographic analysis when performed shall be in accordance with Ministry of Transportation Ontario (MTO) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed one hundred thirty (130).

E18.4.5 Fine Aggregate

- (a) Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, FA1, be graded uniformly and not more than three percent (3%) shall pass a seventy-five (75) micrometre (μm) sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam, or other deleterious substances.
- (b) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

E18.4.6 Coarse Aggregate – Standard

- (a) The maximum nominal size of coarse aggregate shall be twenty (20) mm and meet the grading requirements of CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than two percent (2%) shall pass a seventy-five (75) μm sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter, or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two (2) fractured faces; and shall have an absorption not exceeding three percent (3%).
- (b) The aggregate retained on the five (5) mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.
- (c) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than thirty percent (30%).
- (d) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E18.4.7 Admixtures

- (a) Air-entraining admixtures shall conform to the requirements of ASTM C260.
- (b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.
- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E18.4.8 Cementitious Materials

- (a) Cementitious Materials shall conform to the requirements of CSA-A3000 and shall be free from lumps.
- (b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed eight percent (8%) by mass of cement.
- (c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed twenty-five percent (25%) by mass of cement.
- (d) Cementitious Materials shall be stored in a suitable weather-tight building that shall protect these Materials from dampness and other destructive agents. Cementitious Materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

E18.4.9 Water

- (a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E18.4.10 Formwork

- (a) Formwork Materials shall conform to CSA Standard A23.1, and American Concrete Institution Publication SP4, "Formwork for Concrete."
- (b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121, a minimum of twenty (20) mm thick.
- (c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121.
- (d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (e) No formwork accessories will be allowed to be left in place within fifty (50) mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or stainless steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.
- (h) Walers shall be spruce or pine, with minimum dimensions of one hundred (100) mm by one hundred fifty (150) mm. Studding shall be spruce or pine, with minimum dimensions of fifty (50) mm by one hundred fifty (150) mm.
- (i) Stay-in-place formwork or falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E18.4.11 Form Coating

- (a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.12 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainform, or equivalent in accordance with B7 as accepted by the Contract Administrator. This formwork liner shall be used on all

exposed formed surfaces, except soffit surfaces, or where a normal form finish is specified.

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

E18.4.13 Curing Compound

- (a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309.
- (b) Curing compound for approach slabs and slope paving shall be resin-based and white-pigmented.
- (c) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.14 Curing Blankets

- (a) Curing blankets for wet curing shall be one hundred percent (100%) polyester, three (3) mm thick, white in colour. An approved product is "Mirafi Geotextile P150". Alternately, a ten (10) ounce (oz) burlap, five (5) mil polyethylene, curing blanket white in colour shall be used; "Curelap" manufactured by Midwest Canvas, together with a second layer of burlap, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.15 Bonding Agents

- (a) Latex Bonding Agent:
 - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equivalent in accordance with B7 as accepted by the Contract Administrator. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than twenty-eight (28) days in age, or equivalent in accordance with B7 as accepted by the Contract Administrator.
- (b) Bonding Grout:
 - (i) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
 - ◆ one (1) part water;
 - ◆ one (1) part latex bonding agent; and
 - ◆ 1.5 parts Type GUSF Portland cement.
 - (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E18.4.16 Epoxy Adhesive

- (a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concessive 1001 LPL, Meadows Rezi-Weld 1000, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.17 Epoxy Grout

- (a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.18 Cementitious Grout

- (a) Cementitious grout shall be non-shrink and non-metallic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equivalent in accordance with B7 as accepted by the Contract Administrator. The minimum compressive strength of the grout at twenty-eight (28) days shall be forty (40) megapascals (MPa).

E18.4.19 Patching Mortar

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

E18.4.20 Flexible Joint Sealant

- (a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.21 Fibre Joint Filler

- (a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751 or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.22 EMSEAL Precompressed Foam Joint Filler

- (a) Expansion joint seal shall be EMSEAL BEJS or equivalent in accordance with B7 as approved by the Contract Administrator to ASTM C711 and ASTM G155.
- (b) Sealant system shall be comprised of three (3) components:
 - (i) cellular polyurethane foam impregnated with hydrophobic one hundred percent (100%) acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone;
 - (ii) field-applied epoxy adhesive primer; and
 - (iii) field-injected silicone sealant bands.
- (c) Impregnation agent to have proven non-migratory characteristics. Silicone coating to be highway-grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. Depth of seal as recommended by manufacturer. BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½ inch (twelve (12) mm) down from the substrate surface.
- (d) Material shall be capable, as a dual seal, of movements of plus fifty percent (+50%) to minus fifty percent (-50%) (one hundred percent (100%) total) of nominal material size. Changes in plane and direction shall be executed using factory fabricated "Universal 90" transition assemblies. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.
- (e) All substitute candidates to be certified in writing to be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be certified in writing to be:

- (i) capable of withstanding sixty-five (65) degrees Celsius for three (3) hours while compressed down to the minimum of movement capability dimension of the basis of design product (minus fifty percent (-50%) of normal material size) without evidence of any bleeding of impregnation medium from the material; and
- (ii) that the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (plus fifty percent (+50%) of nominal material size) within twenty-four (24) hours at room temperature twenty (20) degrees Celsius.

E18.4.23 Ethafoam Joint Filler

- (a) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application and shall be the type accepted by the Contract Administrator.

E18.4.24 Low Density Styrofoam

- (a) Low density Styrofoam shall be the type accepted by the Contract Administrator.

E18.4.25 Backup Rod

- (a) Backup rod shall be pre-formed compressible polyethylene, urethane, neoprene, or vinyl foam backer rod, extruded into a closed cell form and oversized thirty to fifty percent (30 to 50%).

E18.4.26 Dampproofing

- (a) Dampproofing Materials shall be applied to all buried concrete surfaces in contact with the soil to within three hundred (300) mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing Materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification CGSB No. 37. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equivalent in accordance with B7 as accepted by the Contract Administrator.
- (b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.
- (c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37. Acceptable products are Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E18.4.27 Waterproofing

- (a) Waterproofing Materials shall be applied as per Drawings.
- (b) Waterproofing sheet membrane shall have the following characteristics:
 - (i) Compliance: AREMA Specification Chapter 29 – Waterproofing;
 - (ii) Thickness: Carrier Film: four (4) mils; Polymeric Membrane: fifty-six (56) mils;
 - (iii) Tensile Strength, ASTM D412, Die C: Carrier Film: five thousand nine hundred (5,900) pounds per square inch (psi) (40.71 MPa) minimum; Polymeric Membrane: four hundred sixty (460) psi (3.23 MPa) minimum;
 - (iv) Elongation, ASTM D412, Die C: Polymeric Membrane: nine hundred seventy-one percent (971%) minimum;
 - (v) Peel Adhesion, ASTM D903: 11.8 pound-force inch (lbf/in.) (two thousand sixty-eight (2,068) Newton metre (N/m));
 - (vi) Lap Adhesion, ASTM D1876: 8.62 lbf/in. (one thousand five hundred eight (1,508) N/m);
 - (vii) Water Vapor Permeability, ASTM E96, Method B: 0.036 perms;

- (viii) Water Absorption, ASTM D570: 0.1 percent, seventy-two (72) hours maximum;
- (ix) Resistance to Hydrostatic Head: Equivalent to 230.9 feet (70.3 metres) of water;
- (x) Puncture Resistance, ASTM E154: 48.2 lbf (214.6 N);
- (xi) Exposure to Fungi, Soil Test: Pass, sixteen (16) weeks; and
- (xii) Acceptable products: MEL-ROL XTL (Extra low temperature) by W.R. Meadows.

- (c) Waterproofing liquid membrane shall have the following characteristics:
 - (i) Contractor to submit product data sheet for review and approval.

E18.4.28 Miscellaneous Materials

- (a) Miscellaneous Materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator.

E18.4.29 Benchmark Plugs

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

E18.5 Equipment

E18.5.1 General

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

E18.5.2 Vibrators

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

E18.6 Construction Methods

E18.6.1 General

- (a) It is intended that this Specification cover all construction Work associated with Structural Concreting operations.
- (b) Rate of application shall be the rate required to meet the requirements of ASTM C309 for the texture of concrete the curing compound is being applied to.

E18.6.2 Temporary False Work, Formwork and Shoring

- (a) Construction Requirements
 - (i) The Contractor shall construct falsework, formwork, and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted Shop Drawings.
 - (ii) All forms shall be of wood, metal, or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the superstructure.
 - (iii) The falsework, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted Shop Drawings.
 - (iv) Forms shall be constructed and maintained so that the completed Work is within minus three (-3) mm or plus six (+6) mm of the dimensions shown on the Drawings.

- (v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
 - (vi) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.
 - (vii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
 - (viii) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
 - (ix) Shores shall be braced horizontally in two (2) directions and diagonally in the same two (2) vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.
 - (x) All exposed edges shall be chamfered twenty (20) mm unless otherwise noted on the Drawings.
 - (xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
- (b) Form panels shall be constructed so that the contact edges are kept flush and aligned.
 - (c) Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below two hundred fifty (250) mm above the top of the upper lift elevation.
 - (d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.
 - (e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.
 - (f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within fifty (50) mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed thirty (30) mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in matching colour of surrounding concrete.
 - (g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
 - (h) It shall be permissible to use the forms over again where possible to a maximum of three (3) uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

- (i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two (2) panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.
- (j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the Site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire Site shall be left in a neat and clean condition.

E18.6.3 Concrete Construction Joints

- (a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.
- (b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.
- (c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.
- (d) Refer to E18.6.11, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E18.6.4 Concrete Control Joints

- (a) Where control joints are shown between areas of floor slabs, they shall be formed by saw cutting to a depth and width shown on the Drawings.
- (b) Carry out saw cutting as soon as the surface can support the saw cutting equipment without damage to the surfaces to be cut.
- (c) Complete saw cutting within twenty-four (24) hours of placing concrete.
- (d) Fill joints with sealant.

E18.6.5 Permeable Formwork Liner

- (a) Permeable formwork liner shall be used on all exposed surfaces, except on soffit surfaces, or surfaces where a normal architectural form finish is specified.
- (b) The permeable formwork liner shall be used for only one (1) application.
- (c) The supply, setup, application, and removal of permeable formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E18.6.6 Architectural Formwork Liner

- (a) Architectural formwork liner shall be used at locations shown on the Drawings.
- (b) The architectural formwork liner shall be replaced after each use unless specifically allowed to be reused by the Manufacturer, as approved by the Contract Administrator.
- (c) The supply, setup, installation, and removal of architectural formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E18.6.7 Control Joint Seals

- (a) Formed control joints sealant for all horizontal, vertical, and sloping joints shall be applied in strict accordance with the details shown on the Drawings and the manufacturer's instructions including appropriate primers if recommended.
- (b) Form control joints shall be thoroughly cleaned before sealing.

E18.6.8 Benchmarks

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

E18.6.9 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
 - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed one hundred twenty (120) minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to ninety (90) minutes.
 - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than one hundred twenty (120) and/or ninety (90) minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement twenty-four (24) hours prior to the scheduled placing of concrete.
 - (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
 - (iv) Unless otherwise noted in Table E13.1, "Requirements for Hardened Concrete", no retarders shall be used.
 - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. Additional water shall not be added to the concrete on-Site.
 - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the City upon request.
- (d) Delivery of Concrete
 - (i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of re-handling, and without damage to the structure or the concrete.

E18.6.10 Concrete Placement Schedule

- (a) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:
 - (i) limit the amount to be placed at any time (using adequate construction joints);
 - (ii) augment his facilities and Plant in order to complete the proposed placement; and
 - (iii) in the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.

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

E18.6.11 Preparation for Concreting Against Hardened Concrete

- (a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:
 - (i) concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris;
 - (ii) all existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues;
 - (iii) surface shall be in saturated surface dry condition with no standing water; and
 - (iv) immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

E18.6.12 Placing Structural Concrete

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
- (b) The chart, Figure D1, Annex D of CSA Standard A23.1 shall be used to estimate surface moisture evaporation rates.
- (c) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
- (d) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
- (e) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (f) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
- (g) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (h) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (i) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (j) The maximum free drop of concrete into the forms shall not be greater than 1.5 metres, otherwise rubber tubes or pouring ports spaced not more than 1.5 metres vertically and 2.5 metres horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (k) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness.

Mechanical vibrators shall have a minimum frequency of seven thousand (7,000) revolutions per minute immersed.

- (l) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally three hundred (300) to nine hundred (900) mm). Apply the vibrator at any point until the concrete is sufficiently compacted (five (5) to fifteen (15) seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job Site during all placing operations.
- (m) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

E18.6.13 Finishing of Concrete Surfaces

- (a) Finishing Operations for Unformed Surfaces
 - (i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the one hundred twenty (120) minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.
- (b) Type 1 Finish – Exposed Formed Surfaces
 - (i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes.
 - (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to three hundred (300) mm below finish grade elevations.
 - (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
 - (iv) The surfaces shall be patched as specified in this Specification.
- (c) Type 2 Finish – Unformed Surfaces
 - (i) All unformed concrete surfaces shall be finished as outlined hereinafter.
 - (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
 - (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
 - (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- (d) Type 3 Finish – Surfaces Below Finished Grade
 - (i) All surfaces below three hundred (300) mm below finished grade except underside of footings shall be patched in accordance with the requirements of E18.4.15, E18.4.16 and E18.6.16 of this Specification.
 - (ii) All surfaces below three hundred (300) mm below finish grade shall receive dampproofing in accordance with E18.4.26 of this Specification.
- (e) Working Base Concrete Finish
 - (i) During placing, concrete working base shall be vibrated, screeded and floated.

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

E18.6.14 General Curing Requirements

- (a) Refer to E18.6.17 for cold weather curing requirements and E18.6.18 of this Specification for hot weather curing requirements.
- (b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.
- (c) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations and continuously wetted for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.
- (d) Curing compound shall be applied at the rate required by the manufacturer's instruction for the accepted product.
- (e) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of twenty-four (24) hours. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.
- (f) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed three (3) degrees Celsius in one (1) hour or twenty (20) degrees Celsius in twenty-four (24) hours.
- (g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator.
- (h) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.
- (i) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

E18.6.15 Form Removal

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.
- (b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.
- (c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for deck extensions shall be twenty-five (25) MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads.
- (d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E18.6.16 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the

Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.

- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within twenty-four (24) hours of formwork removal.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back seventy-five (75) mm from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than five (5) mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one (1) hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.
- (f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.
- (g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E18.6.17 Cold Weather Concreting

- (a) The requirements of CSA Standard A23.1 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below five (5) degrees Celsius during placing or curing.

E18.6.18 Hot Weather Concreting

(a) General

- (i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than twenty-seven (27) degrees Celsius during placing.
- (ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as fifteen (15) degrees Celsius, but not above twenty-five (25) degrees Celsius. Concrete containing silica fume shall be between ten (10) degrees Celsius minimum and eighteen (18) degrees Celsius maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.
- (iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.
- (iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.
- (v) Sun shades and wind breaks shall be used as required during placing and finishing.
- (vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

- (vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.
- (viii) Hot weather curing shall follow immediately after the finishing operation.
- (b) Hot-Weather Curing
 - (i) When the air temperature is at or above twenty-five (25) degrees Celsius, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.
 - (ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above twenty (20) degrees Celsius, in order to minimize the temperature rise of the concrete.
- (c) Job Preparation
 - (i) When the air temperature is forecast to rise to twenty-five (25) degrees Celsius or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.
- (d) Concrete Temperature
 - (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E13.2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

| TABLE E13.2: ACCEPTABLE CONCRETE TEMPERATURES | | |
|--|-----------------------|----------------|
| THICKNESS OF SECTION | TEMPERATURE °C | |
| | MINIMUM | MAXIMUM |
| Less than: | | |
| 1.0 m | 10 | 27 |
| 1.2 m | 5 | 25 |

E18.6.19 Cleanup

- (a) The Contractor shall cleanup equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E18.7 Quality Assurance and Quality Control

E18.7.1 General

- (a) The Contract Administrator shall be afforded full access for the inspection and control and assurance testing of concrete and constituent Materials, both at the Site of Work and at any plant used for the production of concrete, to determine whether the concrete is being supplied in accordance with this Specification.
- (b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.
- (c) The Contractor shall provide, without charge, the samples of concrete and the constituent Materials required for quality assurance tests and provide such assistance and use of tools and construction equipment as is required.
- (d) Quality assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (e) The Contractor will be required to undertake quality control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

- E18.7.2 The frequency and number of concrete quality control tests shall be in accordance with the requirements of CSA Standard A23.1.
- E18.7.3 Inspection
- (a) All workmanship and all Materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of Materials through to final acceptance of the specified Work.
 - (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any Materials or Works, which are not in accordance with the requirements of this Specification.
 - (c) Quality assurance testing shall be undertaken by the Contract Administrator. Quality control testing shall be undertaken by the Contractor.
- E18.7.4 Access
- (a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times. The Contractor shall supply samples to the Contract Administrator or their inspector for testing purposes as required. There will be no charge to the City for samples taken.
- E18.7.5 Materials
- (a) All Materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the quality assurance testing laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any Materials taken by the Contract Administrator for testing purposes.
 - (b) All Materials shall conform to CSA Standard A23.1.
 - (c) All testing of Materials shall conform to CSA Standard A23.2.
 - (d) All Materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such Materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such Material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.
- E18.7.6 Concrete Testing
- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E18.3.2 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
 - (b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E18.4.3 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.
 - (c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract

Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding two hundred thirty (230) microns with no single test greater than two hundred sixty (260) microns.

- (d) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202 and shall meet the requirements of each class of concrete.
- (e) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C, "Sampling Plastic Concrete".
- (f) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (g) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two (2) companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two (2) specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (h) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table E13.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E18.7.7 Corrective Action

- (a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such Materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

E18.8 Measurement and Payment

E18.8.1 Structural Concrete

- (a) Supplying and placing structural concrete will not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all Materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) Items of Work:
 - (i) Structural.
- (c) Supplying and installing all the listed Materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E18.8.2 Concrete Heating and Hoarding

- (a) Where conditions require heating and hoarding of concrete, this Work shall be considered incidental to Structural Concrete and no separate measurement or payment will be made.

E18.8.3 Rigid Insulation

- (a) Supplying and placing rigid insulation will be measured on a square metre basis and paid for at the Contract Unit Price for "Rigid Insulation". The amount to be paid for will be the total area of rigid insulation installed in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E19. SUPPLYING AND PLACING REINFORCING STEEL

E19.1 Description

- (a) It is intended that this Specification cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing, hot-dipped galvanized steel reinforcing and stainless steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E19.2 Scope of Work

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

E19.3 References

- (a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
 - (i) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;
 - (ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
 - (iii) ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement;
 - (iv) ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings;
 - (v) ASTM A767/A767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement;
 - (vi) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
 - (vii) CAN/CSA G30.18 – Billet Steel Bars for Concrete Reinforcement;
 - (viii) ACI 315 – Details and Detailing of Concrete Reinforcement;
 - (ix) ACI 315R – Guide to Presenting Reinforcing Steel Design Details; and
 - (x) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E19.4 Submittals

E19.4.1 General

- (a) At least twenty-one (21) Calendar Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its operators shall be submitted to the Contract Administrator for review and approval.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Calendar Days prior to commencement of any schedule Work on the Site, a proposed schedule, including methods and sequence of operations.

- (c) The Contractor shall submit to the Contract Administrator for review, at least fourteen (14) Calendar Days prior to the commencement of any Work on-Site a certificate of compliance from the manufacturer stating that the stainless steel Materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.
- (d) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on-Site.
- (e) Contractor to submit Quality Control Testing Program to the Contract Administrator.
- (f) Contractor to submit Shop Drawings (including bar lists) in accordance with Specification 01 33 00 – Submittal Procedures and the latest edition of the *Reinforcing Steel Manual of Standard Practice* by the Reinforcing Steel Institute of Canada (RSIC).

E19.5 Materials

E19.5.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all Materials set forth in this Specification. All Materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) Bundles of reinforcing steel shall be identified by tags containing bar marks.
- (c) The reinforcing steel shall not be placed directly on the ground. Sufficient timber pallets or blocking shall be placed under the reinforcing steel to keep them free from dirt and mud.

E19.5.2 Handling and Storage of Stainless Steel Reinforcing

- (a) Stainless steel reinforcing shall be store separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.
- (b) Chains for steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Wood or approved alternate should be used to protect the bars.
- (c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.
- (d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

E19.5.3 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) All reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.
- (c) Stainless steel, as shown on the Drawings, shall be a high-manganese, low-nickel, nitrogen-strengthened austenitic stainless steel. Stainless steel reinforcing shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E14.1, "Type of Stainless Steel Reinforcing". Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by RSIC, Reinforcing Steel Manual of Standard Practice.
- (d) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.
- (e) All reinforcing steel shall be straight and free from paint, oil, mill scale, and injurious defects. Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile properties of

a hand wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18 and ASTM A955M.

| TABLE E14.1 TYPE OF STAINLESS REINFORCING | | |
|--|------------------|------------------------|
| Common or Trade Name | AISI Type | UNS Designation |
| Type 316 LN | 316 LN | S31653 |
| Type 2205 | Duplex 2205 | S31803 |
| Type 2304 | EnduraMet 2304 | S32304 |

E19.5.4 Galvanizing

(a) Shop Applied

- (i) The galvanizing shall be shop applied and strictly in accordance with CSA Standard G164 and ASTM A767M latest addition to a retention equal to a Class II level (six hundred ten (610) g/m²), except as otherwise specified herein.
- (ii) Submit an original and three (3) copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements.
- (iii) Preclean reinforcing steel using acceptable methods to produce an acceptable surface for quality hot-dip galvanizing. If sulphuric acid or hydrochloric acid is used as a pickling bath for precleaning, care shall be exercised to minimize the immersion time. If signs of hydrogen embrittlement are present after pickling due to excessive immersion time, all reinforcing in that shipment will be rejected and shall be replaced at no additional cost to this Contract.
- (iv) Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
- (v) The surface finish shall be continuous, adherent, as smooth and evenly distributed as possible, and free from any defect detrimental to the stated end use of the coated article.
- (vi) Coating adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
- (vii) Sheared ends of bars shall be coated with a zinc-rich formulation before rusting occurs and before shipment to the Site.
- (viii) Furthermore, all field welds, as well as, cracking and other visible damage or deterioration of the hot-dip galvanizing as a result of handling or bending operations, or any other causes, shall be galvanize-coated with field applied galvanizing touch-up material as specified hereinafter.

(b) Field Applied

- (i) All field applied galvanized coatings shall be applied in accordance with ASTM A780M.
- (ii) Further to ASTM A780M, paints used for field applied galvanizing shall contain zinc dust above ninety-two percent (92%) in the dried film.
- (iii) At least seven (7) days prior to any field applied galvanizing, the Contract shall submit the galvanizing product and application details to the Contract Administrator for review.
- (iv) Spray applied field galvanizing will not be permitted. Where restrictions occur that brush applied field galvanizing is not possible, spray applied field galvanizing may be permitted if accepted in writing by the Contract Administrator prior to application.
- (v) All field applied galvanized coatings shall be applied in accordance with the manufacturer's recommendations and as directed by the Contract Administrator.

- (vi) The maximum area to be repaired in the field shall be two thousand (2,000) mm². Any damaged article with a damaged area greater shall be rejected, removed, and replaced at the Contractor's expense.

E19.5.5 Bar Accessories

- (a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.
- (c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.
- (d) Placing of bar supports shall be done to meet the required construction loads.
- (e) Tie wire shall be the following:
 - (i) black, soft-annealed 1.6 mm diameter wire or nylon coated wire for black steel reinforcing;
 - (ii) nylon coated wire or 1.6 mm galvanized coated wire for hot-dipped galvanized steel reinforcing; and
 - (iii) stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.
- (f) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equivalent in accordance with B7 as accepted by the Contract Administrator.
- (g) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (eighteen (18) gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E19.5.6 Mechanical Splices

- (a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, Type 316L, Type 2005, or Type 2304.

E19.6 Construction Methods

E19.6.1 Fabrication of Reinforcing Steel

- (a) General
 - (i) Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18 to the lengths and shapes as shown on the Drawings.
- (b) Black Steel Reinforcing
 - (i) Heating shall not be used as an aid in bending black steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.
- (c) Galvanized Reinforcing Steel
 - (i) The reinforcing fabricator shall consult with the Contractor, Contract Administrator and hot-dip galvanizer regarding potential problems or potential handling problems prior or during the galvanizing process.
 - (ii) Remove all welding slag, splatter, antisplatter compounds, and burrs prior to delivery for galvanizing.

- (iii) Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint, and other deleterious material prior to fabrication.
 - (iv) Remove by blast cleaning or other methods surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation.
 - (v) Hooks or bends should be smooth and not sharp. Bars are to be bent prior to galvanizing. Minimum bend diameters shall be provided in accordance with ASTM A767 latest edition.
 - (vi) The reinforcing shall be a minimum of ten (10) degrees Celsius prior to bending and galvanizing operations, regardless of ambient temperatures in the plant. Where ambient temperatures fall below ten (10) degrees Celsius, bending and galvanizing in a facility that is not enclosed and temperature controlled will not be permitted.
 - (vii) The Contractor is responsible to ensure that accelerated strain-embrittlement does not occur during the manufacturing, bending practices and galvanizing of the reinforcing steel. The Contractor shall submit to the Contract Administrator the following:
 - ◆ Reinforcing Supplier standards of practice for working of reinforcing steel. This shall include bending practices as per ASTM A767-latest addition and temperature requirements during fabrication (bending) of reinforcing. This is to be submitted with the certificate of compliance from the manufacturer as specified in E19.4.1(c).
 - ◆ Contractor is to carry out a Quality Control Testing Program following the requirements as per ASTM A143/A143M-latest addition. This will include but not limited to random bent bars to be tested after galvanizing, photos of items before and after testing, and a report submitted to the Contract Administrator for each trailer load received on-Site. Testing criteria shall be submitted for review and approval to the Contract Administrator at least ten (10) Business Days prior to manufacturing of reinforcing.
- (d) Stainless Steel Reinforcing
- (i) Heating shall not be used as an aid in bending stainless steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.
 - (iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of mill scale, slag, or oxidation. Iron contamination shall be removed with pickling paste or by wire brushing. Wire brush cleaning shall be done with stainless steel wire brushes only.
 - (v) All hand tools shall be stainless tools that have not been used on carbon steel.

E19.6.2 Placing of Reinforcing Steel

- (a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.
- (b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

- (c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.
- (d) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.
- (e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. Bars with bends not shown on the Drawings shall not be used.
- (f) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.
- (g) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.
- (h) Following placement of galvanized-coated bars, all areas of damaged coating shall be repaired using approved touch-up coating material specified in E19.5.4(b).

E19.7 Quality Control

E19.7.1 Inspection

- (a) All workmanship and all Materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of Materials through to final acceptance of the specified Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any Materials or Works which are not in accordance with the requirements of this Specification, regardless of any previous inspection or approval.

E19.7.2 Access

- (a) The Contract Administrator shall be afforded full access for the inspection and control testing of reinforcing steel, both at the Site of Work and at any plant used for the fabrication of the reinforcing steel, to determine whether the reinforcing steel is being supplied in accordance with this Specification.

E19.7.3 Quality Testing

- (a) Quality control testing may be used to determine the acceptability of the reinforcing steel supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

E19.8 Measurement and Payment

- E19.8.1 Supplying and installing all the listed Materials, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Structural". No measurement or payment shall be made for this Work unless indicated otherwise.

E20. SUPPLY, FABRICATION AND ERECTION OF MISCELLANEOUS METAL

E20.1 Description

- (a) It is intended that this Specification cover all operations relating to the supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification.
- (b) Miscellaneous metal includes, but is not limited to;

- (i) galvanized steel guardrail, stairways, and stairway handrails, steel fabrications including the container guides, steel nosings, pole structures for security and facility lighting, anchor bolts, and anchor rods;
 - (ii) quality control of Materials and fabrication, including magnetic particle testing of welds;
 - (iii) galvanizing of miscellaneous metal; and
 - (iv) aluminum hatch covers and frames.
- (c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E20.2 Scope of Work

- (a) The Work under this Specification shall involve the following:
- (i) supply and install galvanized steel guardrails;
 - (ii) supply and install galvanized hoist beams;
 - (iii) supply and install galvanized steel for repair works;
 - (iv) supply and install galvanized grating platform;
 - (v) supply and install aluminum hatch cover and frames;
 - (vi) supply and install of anchor bolts and anchor rods; and
 - (vii) supply and install of miscellaneous pre or post-installed mechanical or adhesive fasteners or anchors related to any of the above works.

E20.3 References and Related Specifications

E20.3.1 Related Specifications

- (a) All related Specifications shall be current issued or latest revision at the first date of Tender advertisement.

E20.3.2 References

- (a) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel;
- (b) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding;
- (c) CSA W59, Welded Steel Construction (Metal Arc Welding);
- (d) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles;
- (e) CSA W47.1, Certification of Companies for Fusion Welding of Steel;
- (f) ASTM A36, Standard Specification for Carbon Structural Steel;
- (g) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless;
- (h) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;
- (i) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products;
- (j) ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications;
- (k) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes;
- (l) ASTM A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes;
- (m) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service;

- (n) ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength;
- (o) ASTM A484, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings;
- (p) ASTM A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength General Use;
- (q) ASTM A1064/1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete;
- (r) ASTM A500/A500M, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;
- (s) ASTM A514/A514M, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding;
- (t) ASTM A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service;
- (u) ASTM A517/A517M, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered;
- (v) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement;
- (w) ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;
- (x) ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength;
- (y) ASTM B22/B22M, Standard Specification for Bronze Castings for Bridges and Turntables;
- (z) ASTM B29, Standard Specification for Refined Lead;
- (aa) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use;
- (bb) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay);
- (cc) AWS D1.5/D1.5M, Bridge Welding Code;
- (dd) AWS D1.1, Structural Welding Code – Steel; and
- (ee) AWS D1.6/D1.6M, Structural Welding Code – Stainless Steel.

E20.4 Submittals

- (a) The Contractor shall submit the following to the Contract Administrator:
 - (i) copies of Mill Test Certificates showing chemical analysis and physical tests of all miscellaneous metal prior to commencement of fabrication. Miscellaneous metal without this certification will be rejected;
 - (ii) certification of chemical analysis and physical tests for all Materials;
 - (iii) a complete set of Shop Drawings prior to commencement of fabrication. The Contractor shall indicate on the Shop Drawings all the necessary Material Specifications for the Materials to be used and identify the components in accordance with the Drawings and Specifications. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings. In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings;
 - (iv) manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator; and
 - (v) all miscellaneous metals Shop Drawings shall be stamped by a Professional Engineer licensed in the Province of Manitoba.

E20.5 Materials

E20.5.1 General

- (a) The Contractor shall mark all Materials to identify its Material Specification and grade. This shall be done by suitable marking or by a recognized colour coding.

E20.5.2 Miscellaneous Metals

- (a) Miscellaneous metals shall conform to the Material grades specified on the Drawings, and meet the requirements and satisfy the testing procedures of CSA G40.21.

E20.5.3 Welded Steel Construction

- (a) Welded steel construction (Metal Arc Welding) shall conform to the requirements and satisfy the testing procedures of CSA W59 and Welded Highway and Railway Bridges – AWS D1.1 of The American Welding Society and Addendum.

E20.5.4 Zinc

- (a) Zinc for hot dipped, galvanized coatings shall conform to the requirements of ASTM A123.

E20.5.5 Steel Pipe for Handrail and Guardrail

- (a) Steel pipe or tubing for handrail and guardrail shall be seamless pipe in accordance with ASTM A53 Type S, Grade A or B.
- (b) Steel shall be hot-dip galvanized in accordance with this Specification.

E20.5.6 Stainless Steel

- (a) Stainless steel bolts, nuts, washers, inserts, and the like as shown on the Drawings shall conform to the requirements of ASTM A320, Grade B8, Class 2.
- (b) Stainless steel plates and perforated plates as shown on the Drawings shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirement for ASTM A240 and ASTM A666.
- (c) Stainless steel shapes, such as angles, shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirements of ASTM A276.
- (d) Stainless steel pipe or tubing, not electrical conduit, shall be Type 316 or Type 316L, UNS S31600 or UNS S31603 and conform to the requirements of ASTM A312. Stainless steel pipe for guardrails or handrails shall be seamless.

E20.5.7 Post-installed fasteners

- (a) Post-installed mechanical fasteners shall be Hilti Kwik Bolt TZ Wedge Anchor, Stainless Steel or equivalent in accordance with B7 as approved by the Contract Administrator unless shown otherwise on the Drawings. The size and Material shall be in accordance with the Drawings.
- (b) Post-installed adhesive anchors shall be accomplished using Hilti Hit Hy 200, or equivalent in accordance with B7 as approved by the Contract Administrator. The size and Material shall be in accordance with the Drawings.
- (c) Installation of anchorages shall be carried out in accordance with the manufacturer's recommendations.

E20.5.8 Anchor Bolts

- (a) Anchor bolts shall be manufactured in accordance with ASTM F1554 (grade 105). The size shall be in accordance with the Drawings.

E20.6 Construction Methods

E20.6.1 General

- (a) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.
- (b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.
- (c) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.
- (d) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.
- (e) Field high-tensile bolted connections shall have all holes drilled or sub-punched and reamed using steel templates. Templates shall be located with utmost care as to position and angle and firmly bolted in place.
- (f) Cutting shall be in accordance with AWS D1.1, D1.6 and CSA W59.

E20.6.2 Clean Material

- (a) The Material shall be clean, free from rust, mill scale, and other foreign matter before being worked in the shop. Material shall be cleaned by wheelabrating, sandblasting or other methods subject to the Contract Administrator's approval.

E20.6.3 Finish

- (a) All portions of the Work shall be neatly finished. Shearing, cutting, chipping, and machining shall be done neatly and accurately. Finished members shall be true to line and free from twists, bends, open joints, and sharp corners and edges.

E20.6.4 Bending

- (a) When bending is necessary in order to meet the requirements of the design, it shall be done with care and by methods subject to the approval of the Contract Administrator. The bend line shall be at right angles to the direction of rolling. The internal radius of bend of load carrying sections shall not be less than twice the thickness of the bend section when bent cold, and if a smaller radius of bend is essential, the Material shall be bent hot and later annealed. Before bending, the edges of the section in the region of the bend shall be smoothed and rounded to a radius of two (2) mm.

E20.6.5 Holes

- (a) General – Except where a specific method of holing materials is shown on the Drawings or required in the Special Provisions, all holes shall be either drilled or sub-punched and reamed with the exception of the holes and slots in the rectangular steel guardrail which may be punched. Poor matching holes will be cause for rejection.
- (b) Punched Holes and Slots – For holes and slots punched full size, the diameter or size of the die shall not exceed that of the punch by more than two (2) mm. All holes and slots which are punched shall have burrs and sharp edges removed. All holes shall be clean-cut without torn or ragged edges. The punching shall not distort the structural member. If required by the Contract Administrator, a sample of the punching operation shall be carried out to the satisfaction of the Contract Administrator prior to the start of fabrication.
- (c) Drilled Holes – Drilling shall be done with twist drills or core drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.
- (d) Sub-Punched and Reamed Holes – All holes shall be sub-punched or sub-drilled to a diameter five (5) mm smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than two (2) mm. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and

all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.

- (e) Allowable Tolerance for Holes – All matching holes for bolts shall register with each other so that a gauge two (2) mm less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than two (2) mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The center-to-center distance between any two (2) holes of a group of holes shall not vary by more than one (1) mm from the dimensioned distance between such holes. Mispunched or misdrilled members shall not be corrected by welding.

E20.6.6

Welding

(a) Specifications

- (i) Welding shall conform to the requirements of the Structural Welding Code – Steel of the American Welding Society AWS D1.1 and addendum and CSA W59 Welded Steel Construction. Welding of stainless steel shall conform to the requirement of the American Welding Society AWS D1.6.

(b) Welding Operator Qualification

- (i) Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work.
- (ii) Qualification shall have been issued within two (2) years of commencement of fabrication. The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he will use and all pertinent data of the tests.
- (iii) Evidence that the welding operators have been executing satisfactory welding in the required processes within the six (6) month period immediately prior to commencement of fabrication shall also be provided to the Contract Administrator.
- (iv) The Contractor shall bear the whole cost and be fully responsible for the qualification of all welding operators.

(c) Welding Procedures, Specifications, and Qualification

- (i) Welding procedures that conform in all respects to the approved procedures of AWS D1.1, D1.6 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications.
- (ii) Welding procedures that do not conform to approved procedures in AWS D1.1, D1.6 and CSA W59 shall be qualified by tests carried out in accordance with AWS D1.1 or D1.6.
- (iii) The Contract Administrator may accept previous qualifications of the welding procedure.

(d) Welding Materials

- (i) All electrodes for manual shielded metal arc welding shall conform to the low hydrogen classification requirements of the latest edition of the American Welding Society's Filler Metal Specification AWS A5.1/A5.1M or AWS A5.5/A5.5M and the CAN/CSA W48 Specification and be capable of producing weld metal having an impact strength of at least twenty-seven (27) J (Charpy V-Notch) at minus eighteen (-18) degrees Celsius.
- (ii) All bare electrodes and flux used in combination for submerged arc welding, the electrode and gas shielding used in combination for gas metal-arc welding, or the electrode and shielding medium used in combination for flux cored arc welding of steels shall conform to the requirements in the latest edition of the American Welding Society AWS A5.17/A5.17M, A5.18/A5.18M or A5.20/A5.20M and CAN/CSA W48 and be capable of producing weld metal having a minimum impact strength of twenty-seven (27) J (Charpy V Notch) at

- minus eighteen (-18) degrees Celsius or shall be capable of producing low alloy weld metal having the mechanical properties listed in AWS D1.1.
- (iii) Low alloy weld properties shall be determined from a multiple pass weld made in accordance with the requirements of the latest edition of the applicable Specification (AWS A5.17/A5.17M, A5.18/A5.18M, or A5.20/A5.20M) or the welding procedure Specification.
 - (iv) Every user shall demonstrate that each combination of electrode and shielding medium will produce weld metal having the above mechanical properties until the applicable AWS Filler Metal Specification is issued. At that time, the AWS Filler Metal Specification will control. The test assembly for Grades E100XX and E110XX shall be made using CAN/CSA G40.21M 700Q or ASTM A514/A517 steel.
 - (v) The Contract Administrator may accept evidence of record of a combination that has been satisfactory tested in lieu of the test required, provided the same welding procedure is used.
 - (vi) Electrodes conforming to AWS A5.1 shall be purchased and delivered in hermetically sealed containers or shall be dried for at least two (2) hours between two hundred thirty (230) degrees Celsius and two hundred sixty (260) degrees Celsius before they are used. Electrodes conforming to AWS A5.5 shall be purchased and delivered in hermetically sealed containers or shall be dried one (1) hour plus fifteen (15) minutes at a temperature of four hundred twenty-five (425) degrees Celsius + fifteen (15) degrees Celsius before being used.
 - (vii) All electrodes for use in welding ASTM A514/A517 and CSA 700 Q. steel having a strength lower than that of the E100XX classification shall be dried for one (1) hour plus fifteen (15) minutes at a temperature of four hundred twenty-five (425) degrees Celsius + fifteen (15) degrees Celsius before being used. Electrodes shall be dried prior to use if the hermetically sealed container shows evidence of damage.
 - (viii) Immediately after removal from hermetically sealed containers or from drying ovens, electrodes shall be stored in ovens held at a temperature of at least one hundred twenty (120) degrees Celsius.
 - (ix) E70XX electrodes that are not used within four (4) hours, E80XX within two (2) hours, E90XX within one (1) hour, and E100XX and E110XX within 0.5 hours after removal from hermetically sealed containers or removal from a drying or storage oven shall be re-dried before use.
 - (x) In humid atmospheres, these time limits will be reduced as directed by the Contract Administrator.
 - (xi) Electrodes that have been wet shall not be used. Electrodes shall be re-dried no more than once.
 - (xii) Flux used for submerged arc welding shall be non-hygroscopic, dry and free of contamination from dirt, mill-scale, or other foreign material. All flux shall be purchased in moisture-proof packages capable of being stored under normal conditions for at least six (6) months without such storage affecting its welding characteristics or weld properties. Flux from packages damaged in transit or handling shall be discarded or shall be dried before use at a minimum temperature of one hundred twenty (120) degrees Celsius for one (1) hour. Flux shall be placed in the dispensing system immediately upon opening a package. If flux is used from an open package or an open hopper that has been inoperative for four (4) hours or more, the top twenty-five (25) mm shall be discarded. Flux that has been wet shall not be used. Flux fused in welding shall not be reused.
- (e) Preheat and Interpass Temperature
- (i) The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1, D1.6 and CSA W59.

- (f) Welding Processes
 - (i) Welding processes which do not conform to the provisions of AWS D1.1, D1.6 or CSA W59 shall not be used without the written approval of the Contract Administrator.
- (g) Distortion and Shrinkage Stresses
 - (i) Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution, and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of one hundred twenty (120) degrees Celsius, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.1, D1.6, and CSA W59 shall be followed in the control of distortion and shrinkage stresses.
- (h) Tack Welding
 - (i) All tack welds shall be a minimum of ten (10) mm in length and made with low hydrogen electrodes and shall not be incorporated in the final structure without specific written authorization by the Contract Administrator.

E20.6.7 Hot-Dip Galvanizing

- (a) Galvanizing, when called for on the Drawings, for items other than fasteners shall be done in accordance with ASTM A123. All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material by commercial sand, grit, or shop blasting or pickling prior to galvanizing. Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling.

E20.6.8 Handling, Delivery, and Storage of Materials

- (a) Precautionary measures shall be taken to avoid damage to miscellaneous metal during handling, transit, stockpiling and erecting. Pinholes or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of miscellaneous metal.
- (b) Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.
- (c) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the miscellaneous metal. The Materials shall be kept separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

E20.6.9 Erection

- (a) Layout before erection of miscellaneous metal, the Contractor shall satisfy him/herself that the installation locations are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.
- (b) Workmanship
 - (i) The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The Material shall be handled carefully so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted.
- (c) Misfits and Field Fitting
 - (i) Misfits of any part or parts to be erected under this Specification may be cause for rejection. No field fitting shall be undertaken by the Contractor until the cause for misfit of parts has been determined and the Contract Administrator, so informed, has given direct approval to accept the Contractor's proposed corrective measures. The Contract Administrator's decision as to the quantity of such Work to be performed at the Contactor's expense will be final and binding.
- (d) Field Welding

- (i) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings, AWS D1.1 and CSA W59.
- (e) Final Cleaning
 - (i) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E20.7 Quality Control and Quality Assurance

E20.7.1 Quality Control

- (a) The Contractor shall be responsible for making a thorough inspection of Materials to be supplied under this Work. All miscellaneous metal shall be free of surface imperfections, pipes, porosity, laps, laminations, and other defects.
- (b) Welding
 - (i) All welding may be subject to inspection by Non-Destructive Testing. This inspection shall be carried out in a manner approved of the Contract Administrator. The Contractor shall provide sufficient access and shop area to permit the performance of the tests. The Contractor shall give the Contract Administrator no less than twenty-four (24) hours' notice of when Work will be ready for testing and shall advise the Contract Administrator of the type and quantity of Work that will be ready for testing.
 - (ii) All defects revealed shall be repaired by the Contractor at his/her own expense and to the approval of the Contract Administrator.

E20.7.2 Quality Assurance

- (a) All Materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions for Construction, if, in the opinion of the Contract Administrator, the Materials involved do not meet the requirements of the Drawings and this Specification.
- (b) All Materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.
- (c) The Contractor shall furnish facilities for the inspection of Material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the works.

E20.8 Measurement and Payment

E20.8.1 Miscellaneous Metal will be measured on a unit basis and paid for at the Contract Unit Price for "Items of Work" listed here below. The amount to be paid for will be the total number of units installed in accordance with this Specification, Drawings, and accepted and measured by the Contract Administrator.

E20.8.2 Items of Work:

- (a) Structural.

E21. PATCHING OF EXISTING PAVEMENT

E21.1 Description

E21.1.1 It is intended that this Specification cover patching of existing concrete pavement in preparation for an asphalt overlay.

E21.2 References

- (a) CW 3110 – Sub-Grade, Sub-Base and Base Course Construction;
- (b) CW 3130 – Supply and Installation of Geotextile Fabrics; and

(c) CW 3410 – Asphaltic Concrete Pavement Works.

E21.3 Materials

E21.3.1 Crushed Sub-Base Material

- (a) Crushed Sub-base Material will have a maximum aggregate size of fifty (50) mm and be supplied in accordance with CW 3110.

E21.3.2 Geotextile Fabric

- (a) Geotextile fabric will be supplied in accordance with Section 2 of CW 3130.

E21.3.3 Asphalt Material

- (a) Asphalt Material will be Type 1A and will be supplied in accordance with Sections 5 and 6 of CW 3410.

E21.4 Construction Methods

E21.4.1 General

- (a) Remove existing concrete pavement to a minimum width of 1.5 metres at locations as shown on the Drawings or as directed by the Contract Administrator in accordance with Section 3.1 of Specification CW 3110.
- (b) Excavate to a depth of three hundred fifty (350) mm below the top of the existing pavement.
- (c) Compact existing sub-grade to a minimum of ninety-five percent (95%) Standard Proctor Density.
- (d) Place geotextile fabric in accordance with Specification CW 3130.
- (e) Place and compact crushed sub-base Material in accordance with CW 3110 to a three hundred (300) mm compacted depth. Compact to a minimum of one hundred percent (100%) Standard Proctor Density.
- (f) Place and compact asphalt Material to a fifty (50) mm compacted depth matching the top of the existing concrete pavement. Compact to an average of ninety-five percent (95%) of the 75 Blow Marshall Density of the paving mixture with no individual test being less than ninety percent (90%).
- (g) Each layer must be levelled and accepted by the Contract Administrator before the succeeding layer may be placed.
- (h) Additional excavation and placement of sub-base Material beyond the identified pavement structure will be completed in accordance with CW 3110 as directed by the Contract Administrator.

E21.5 Measurement And Payment

- E21.5.1 Pavement patching will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Pavement Patching". The area to be paid for will be the total number of square metres of pavement patched in accordance with this Specification, accepted and measured by the Contract Administrator.