THE CITY OF WINNIPEG

TENDER

TENDER NO. 1012-2025

LOUISE BRIDGE SUBSTRUCTURE REHABILITATION WORKS – PHASE 1

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 LOUISE BRIDGE SUBSTRUCTURE REHABILITATION WORKS – PHASE 1

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, December 5, 2025.

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

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the Bidder may view the Site without making an appointment.

B3.2 The Bidder is advised that at no time can the Bidder access any other private owned property unless authorized by the Contract Administrator in writing.

B3.3 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 D4.1.

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

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

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

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

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

B5. CONFIDENTIALITY

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

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

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

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

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

B6. ADDENDA

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

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

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

B6.4 The Bidder is responsible for ensuring that 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 D4.

B7. SUBSTITUTES

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

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

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

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

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

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

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

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

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

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in 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;

(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;

(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 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;

(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 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.

B10.2 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) Keller North America

(i) Information regarding installation of micro-pile foundations and sheet piling.

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; and

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

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

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

(a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

B13.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

(a) have successfully carried out work similar in nature, scope and value to the Work; and

(b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and

(c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);

(d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and C6.19)

(e) have previously successfully performed in-river structural rehabilitation works on a bridge or similar structure;

(f) have previously successfully installed micro-piles in-river.

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 at http://www.winnipeg.ca/matmgt/Safety/safety_consultant.stm.

B13.5 Further to B13.3(d), the Bidder acknowledges that they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at

https://accessibilitymb.ca/resources-events-and-training/online-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 at: https://www.winnipeg.ca/media/4929/.

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

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

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

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

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

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

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

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

B14.4.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

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

B14.6 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Tender.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 Bids will not be opened publicly.

B15.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (unevaluated and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.

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

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

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

B16. IRREVOCABLE BID

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

B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly formed and the contract securities have been furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B17. WITHDRAWAL OF BIDS

B17.1 A Bidder may withdraw their Bid without penalty 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 therefrom (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B13 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B7.

B18.2 Further to B18.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

B18.2.1 Any bid with an apparent imbalance between the unit prices in Part 1 and Part 2 may be determined to be non-responsive and rejected by the Award Authority in their sole discretion; acting reasonably.

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 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 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2026 Capital Budget. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.

B19.4 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 2025-11-01) 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of structural pier rehabilitation works underwater riprap placement and installation of bridge bearings.

D2.2 Parts of Work include:

(a) Part 1 – must be completed by June 30, 2026 and shall include structural pier rehabilitation and riprap placement at Pier SU2 as well as bridge bearing replacement at the South Abutment. SU1.

(b) Part 2 – may be undertaken in the same timeframe as Part 1 or may be deferred to fall/winter of 2026/2027 and be completed by June 30, 2027. The exact schedule is subject to the Contractor's binding declaration as per D21. It shall consist of structural pier rehabilitation and riprap placement at SU4 and bridge bearing replacement at SU5.

D2.3 The major components of the Work for both Part 1 and Part 2 are as follows:

(a) Mobilization

(b) Traffic Control

(c) Installation and removal of temporary access berms in the Red River.

(d) Supply and installation of sheet piling around perimeter of river piers.

(e) Partial removal of existing concrete collars on limestone block river piers.

(f) Design, supply, and installation of micro-piles around perimeter of river piers.

(g) Installation of reinforcement ties including coring transversely through concrete-rubble-filled limestone block pier shafts, casing the core holes and grouting the bars.

(h) Supply and installation of reinforcing steel dowels into the limestone block piers.

(i) Supply and placement of concrete reinforcing steel.

(j) Supply and installation of reinforced concrete base slabs and pier jackets at river piers.

(k) Supply and placement of underwater riprap.

(l) Temporary jacking and support of bridge superstructure.

(m) Removal of existing bridge bearings.

(n) Installation of new bridge bearings supplied by others.

(o) Fabrication of miscellaneous metal.

D3. DEFINITIONS

D3.1 When used in this Tender:

(a) **"ACI"** means the American Concrete Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

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

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

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

(e) "**CWB**" means the Canadian Welding Bureau that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Tender shall apply to the Work.

(f) "**ICRI**" means the International Concrete Repair Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(g) **"MOT" (Maintenance of Traffic)** refers to the Contractor's ongoing responsibility to implement, monitor, and maintain temporary traffic control devices and strategies in accordance with the accepted Traffic Management Plan, ensuring the safe and continuous movement of traffic through or adjacent to the Work area.

(h) "**Others**" means any person, firm, corporation, utility or other entity employed by or having a contract directly or indirectly with the City other than through the Contractor.

(i) **"ROW" (Right-of-Way)** means land reserved for transportation or utility purposes. This term refers to City of Winnipeg right-of-way which includes roads, sidewalks, pathways, bridges and utility corridors under municipal jurisdiction.

(j) "**RSIC**" means the Reinforcing Steel Institute of Canada that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Tender shall apply to the Work.

(k) "**Shop Drawing Submission**" refers to a compilation of drawings, diagrams, schedules, and other data prepared by the Contractor or Subcontractors and submitted to the Contract Administrator for review. Shop Drawings illustrate the details of specific portions of the Work, including fabrication, installation, and interface with existing infrastructure

(l) **"TMP" (Traffic Management Plan)** means a Contractor-prepared document, subject to review and acceptance by the Contract Administrator, outlining the strategies, staging, signage, detour routes, and controls to manage vehicular, pedestrian, and cyclist traffic during construction. The TMP shall ensure safe and efficient movement through and around the Work site while minimizing disruption to the public.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is Tetra Tech Canada Inc. , represented by:

Tim Neirinck, M.Sc., P.Eng.
Structural Engineer

Telephone No. 204-471-4275
Email Address tim.neirinck@tetratech.com

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

D5. CONTRACTOR'S SUPERVISOR

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

D5.2 At least two (2) Business Days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D6. FURNISHING OF DOCUMENTS

D6.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D7. AUTHORITY TO CARRY ON BUSINESS

D7.1 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.

D8. SAFE WORK PLAN

D8.1 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.

D8.2 The Safe Work Plan shall 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D8.3 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.

D9. INSURANCE

D9.1 The Contractor shall provide and maintain the following insurance coverage:

(a) commercial general liability insurance, in the amount of at least five million dollars ($5,000,000.00) inclusive, with The City of Winnipeg and Correia Enterprises Ltd (if applicable) 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, sudden and accidental pollution liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

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

(c) Property insurance for all contractors' equipment, mobile offices, portable toilets, tools and machinery that may be owned, rented, leased or borrowed.

(d) 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, policy to remain in place during the performance of the work and until the date of substantial completion or other agreed upon date.

(e) Contractors pollution liability insurance in the minimum amount of one million dollars ($1,000,00) per occurrence and two million dollars ($2,000,000) in the aggregate insuring against claims covering third party injury and property damage claims including clean up costs and transport cargo as a result of a pollution condition arising suddenly or gradually from the contractors operations and completed operations. Such policy to name the City as an additional insured and remain in place throughout the warranty period.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 All subcontractors performing work shall provide the Contractor with evidence of insurance as outlined in D9.1(a) and (b) above and be registered with Workers Compensation Board of Manitoba and maintain insurance and workers compensation coverage throughout the performance of the work, the Contractor shall provide the Contract Administrator with evidence of same prior to the commencement of any work by the subcontractor.

D9.4 All policies shall be taken out with insurers licensed in the Province of Manitoba.

D9.5 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.

D9.6 The Contractor shall provide the certificate of insurance, in a form satisfactory to the Supervisor of Insurance, to the following address:

The City of Winnipeg

Risk Management – Insurance Section

185 King Street, 3rd Floor

Winnipeg, MB R3B 1J1

A copy of the certificate of insurance shall be provided to the Contract Administrator at least two (2) Business Days prior to the commencement of any work on the site.

D10. CONTRACT SECURITY

D10.1 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 amount of fifty percent (50%) of the Contract Price; and

(b) labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in an amount equal to fifty percent (50%) of the Contract Price.

D10.1.1 Bonds are available at:

(a) Performance Bond https://www.winnipeg.ca//media/4928/

(i) Performance Bond – Schedule A - Form of Notice https://www.winnipeg.ca/media/4831/

(ii) Performance Bond – Schedule B – Surety's Acknowledgement https://www.winnipeg.ca/media/4832/

(iii) Performance Bond – Schedule C – Surety's Position https://www.winnipeg.ca/media/4833/

(b) Labour & Material Payment Bond https://www.winnipeg.ca//media/4930/

(i) L&M Bond – Schedule A – Notice of Claim https://www.winnipeg.ca/media/4834/

(ii) L&M Bond – Schedule B – Acknowledgement of a Notice https://www.winnipeg.ca/media/4835/

(iii) L&M Bond – Schedule C – Surety's Position https://www.winnipeg.ca/media/4836/

D10.1.2 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

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

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

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

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

(e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D10.1(b).

D10.1.3 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.

D10.1.4 Digital bonds passing the verification process will be treated as original and authentic.

D10.2 The Contractor shall provide the Contract Administrator identified in D4 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.

D10.3 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 inD10.1(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.

D11. SUBCONTRACTOR LIST

D11.1 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 or prior to a pre-construction meeting or at least two (2) Business Days prior to the commencement of any Work on the Site.

D12. EQUIPMENT LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site.

D13. DETAILED WORK SCHEDULE

D13.1 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

D13.2 The detailed work schedule shall consist of a “baseline schedule” component showing the planned start and completion dates for all activities/tasks. In addition, the detailed work schedule shall consist of an “update schedule” component showing the Contractor’s updated planned or actual start, progress and completion dates for each activity/task as construction proceeds in order to compare Contractor’s planned baseline schedule versus actual execution of the Work.

D13.3 The Contractor’s planned baseline detailed work schedule will be reviewed by Contract Administrator as a Submittal for conformance to the Project intent and general conformance to the requirements of the Contract.

D13.4 The Contractor shall not change the baseline portion of the detailed work schedule, once it has been reviewed without issue by the Contract Administrator, without prior consent or until requested by the Contract Administrator.

D13.5 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) capacity to show simultaneously the planned baseline schedule as well as the update schedule for each activity/task.

all acceptable to the Contract Administrator.

D13.6 Further to D13.5(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) Date of Commencement of the Work;

(b) Mobilization to Site;

(c) Critical Stages as listed in D22;

(d) Substantial Performance;

(e) Total Performance;

(f) Demobilization from Site; and

(g) Site restoration and other Maintenance.

D13.7 Further to D13.5(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.

D13.8 Without changing the baseline portion of the detailed work schedule, at least once per month or within two (2) Working Days upon request from the Contract Administrator, Contractor shall accurately update the “update schedule”.

D13.9 Should Contractor’s operations fall behind the accepted detailed work schedule, Contractor shall, at no change in Contract Price, take corrective action to get back on schedule.

D13.10 Contractor shall provide sub-schedules to define critical portions of the Work upon reasonable request from the Contract Administrator.

D14. ENVIRONMENTAL PROTECTION PLAN

D14.1 Prior to commencing construction activities or delivery of materials to Site, submit an Environmental Protection Plan for review and approval by Contract Administrator. The Environmental Protection Plan shall present a comprehensive plan to address all of the Contractor’s chosen means and methods towards performing the Work that may impact the environment. The submission of the Environmental Protection Plan to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the success or failure of all environmental management practices and procedures. The environmental protection plan shall

demonstrate the contractor's compliance with the DFO Fisheries Act Authorization included within Appendix B.

D14.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal
  (i) Canadian Environmental Assessment Act, 2012 (CEAA, 2012)
  (ii) Canadian Environmental Protection Act (CEPA) C.33;
  (iii) Hazardous Products Act C.H.-3;
  (iv) Transportation of Dangerous Goods Act and Regulations C.34;
  (v) Migratory Birds Convention Act and Regulations, c. 22;
  (vi) Species at Risk Act, c. 29;
  (vii) And any other applicable Acts, Regulations and By-laws;
  (viii) Federal Policy on Wetland Conservation 1991;
  (ix) Transportation Association of Canada's National Guide to Erosion and Sediment Control on Roadway Projects, 2005.

(b) Provincial
  (i) The Dangerous Goods Handling and Transportation Act D12;
  (ii) The Endangered Species and Ecosystems Act E111;
  (iii) The Environment Act C.E125;
  (iv) The Fire Prevention Act F80;
  (v) The Manitoba Heritage Resources Act H39-1;
  (vi) The Manitoba Noxious Weeds Act N110;
  (vii) The Manitoba Nuisance Act N120;
  (viii) Pesticides and Fertilizers Control Act P40;
  (ix) The Water Protection Act, c. W65;
  (x) The Public Health Act C.P210; and
  (xi) The Workplace Safety and Health Act W210;
  (xii) Habitat, Manitoba Natural Resources and DFO, 1996;
  (xiii) And current applicable associated regulations;
  (xiv) And any other applicable Acts, Regulations, and By-laws.

(c) Municipal
  (i) The City of Winnipeg By-law Neighbourhood Liveability No. 1/2008 and all amendments;
  (ii) The City of Winnipeg Traffic By-law No. 1573/77 and all amendments;
  (iii) City of Winnipeg Motor Vehicle Noise Policies and Guidelines;
  (iv) The City of Winnipeg Sewer By-law No. 92/2010 and all amendments;
  (v) Any other applicable Acts, Regulations, and By-laws and associated updates and amendments.

D14.3 The Contractor is advised that the following environmental protection measures apply to the Work.

D14.3.1 Materials Handling and Storage

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

(b) Construction materials will not be deposited or stored on or near ponds, ditches, LDSs, unless written acceptance from the Contract Administrator is received in advance.

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

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

D14.3.2 Fuel Handling and Storage

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

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

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

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

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

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

(g) Wash, refuel and service machinery and store fuel and other materials for the machinery a minimum of 100 m away from ponds, ditches, LDS's to prevent deleterious substances from entering the water.

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

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

(j) Machinery is to arrive on Site in a clean condition and is to be maintained free of fluid leaks.

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

D14.3.3 Waste Handling and Disposal

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

(b) At no time during construction will personnel or construction waste be permitted to accumulate for more than one (1) day at any location on the construction Site, other than at a dedicated storage area as may be approved by the Contract Administrator.

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

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

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

(f) Indiscriminate dumping, littering, or abandonment will not take place.

(g) No burning of waste or other materials is permitted.

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

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

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

(k) Waste storage areas will not be located so as to block natural drainage.

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

(m) Equipment will not be cleaned near (within 100 m) watercourses; contaminated water from onshore cleaning operations will not be permitted to enter watercourses.

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

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

D14.3.4 Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

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

(d) Different waste streams will not be mixed.

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

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

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

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

(i) Dangerous goods/hazardous waste storage areas will be located at least 100 m away from the ordinary high water line of any watercourse or wetland areas and be diked.

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

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

D14.3.5 Emergency Response

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

(b) The Contractor will report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table D14.1 below) to Manitoba Sustainable Development, immediately after occurrence of the environmental accident, by calling the 24 hour emergency phone number (204) 945-4888.

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

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

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

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

(ii) Attend to public safety:

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

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

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

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

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

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

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

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

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

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

Table E14 -1: Environmental Accident Reporting

Reportable Quantities of Spills that must be Reported to Manitoba Sustainable Development [(204) 944-4888]

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

* Container Capacity (refers to container water capacity)
Source: Environmental Accident Reporting Regulation M.R. 439/87

D14.3.6 Noise and Vibration

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

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

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

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

D14.3.7 Dust and Emissions

(a) Construction vehicles and machinery will be kept in good working order by the Contractor through the use of inspection and maintenance.

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

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

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

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

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

D14.3.8 Erosion Control

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

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

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

(d) Exposure of soils along drain slopes will be kept to the minimum practical amount, acceptable to the Contract Administrator.

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

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

(g) The disturbed surface will be revegetated as soon as possible and done so as to create a dense root system in order to defend against soil erosion within the Work area and any other disturbed areas susceptible to erosion.

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

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

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

D14.3.9 Runoff Control

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

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

(c) Construction activities on erodible slopes will be avoided during spring runoff and heavy rain falls.

(d) Soil and fill will not be stockpiled on immediate watercourse bank areas

D14.3.10 Wildlife

(a) The Contractor will adhere to all of the protection measures below, as well as the protection and mitigation measures for barn swallows, a Migratory bird species also protected under the federal Species At Risk Act (SARA).

(b) The clearing of trees, shrubs or vegetation should be avoided between May 15 and September 30 of any year to protect nesting and breeding season for migratory birds and other wildlife, unless otherwise identified by a Project Biologist. Any trees or shrubs to be removed should be checked for active nests before removal.

(c) No one will disturb, move or destroy migratory birds' nests;

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

(e) In the event that Species At Risk are encountered during the project construction, all Work will cease in the immediate area, the Site will be made safe and the Contract Administrator will be contacted.

D14.3.11 Wetlands

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

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

(c) Wetlands will not be disturbed without written permission from the Contract Administrator.

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

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

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

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

D14.3.12 Vegetation

(a) The Contractor will clearly mark the disturbance limit prior to commencement of the Work and will remain marked throughout the construction period.

(b) Vegetation will not be disturbed without written permission from the Contract Administrator.

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

(d) Herbicides and pesticides will not be used adjacent to any surface watercourse.

(e) Trees or shrubs will not be felled into watercourses.

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

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

D14.3.13 Landscaping

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

(b) Topsoil will be stripped prior to construction and salvaged for use during landscaping.

(c) Surplus topsoil will be properly stockpiled for use in other projects.

(d) The Contractor will adhere to the landscaping plan for the maintenance of initial stages and development stages of the plant community.

D14.3.14 Heritage Resources

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

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

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

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

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

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

(g) If the human remains are considered forensic, the City of Winnipeg Police will be responsible for their removal.

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

D14.3.15 Construction Traffic

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

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

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

(d) The Contractor’s laydown area, construction Site and access road will be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to

construction areas and to control any potential hazard to the public, particularly children.

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

D14.4 Notwithstanding the measurement and payment terms of Environmental Protection Plan shall be considered incidental to the Work.

D15. ENVIRONMENTAL PROTECTION PLAN – WATERWAYS PERMIT

D15.1 In addition to D14, the Waterways Permit will be issued once authorized by the City of Winnipeg Waterways Section and will state condition that the Contractor shall abide by.

D15.2 The Contractor shall provide appropriate mitigation and protection measures as required in and around the regulated area in a manner that protects and sustains the environment.

D15.3 Notwithstanding the measurement and payment terms of Environmental Protection Plan – Waterways Permit during construction, including monitoring will be considered incidental to all Work.

D16. ENVIRONMENTAL PROTECTION PLAN – TRANSPORT CANADA AUTHORIZATION AND RED RIVER NAVIGATION PROTECTION PLAN

D16.1 In addition to D14, the Transport Canada authorization will be issued once authorized by Transportation Canada and will state conditions that the Contractor shall abide by.

D16.2 The Contractor shall provide appropriate mitigation and protection measures as required in and around the regulated area in a manner that protects and sustains the environment.

D16.3 The Red River is open to navigation from approximately mid-April to mid-November, annually. During this period, it will be the responsibility of the Contractor to fully ensure the safety of river users. Also, during this period, the Contractor shall ensure that the dimensions of the navigation channel are not restricted in any way.

D16.4 The existing boat launch (south side) shall be accessible, functional, and unimpeded by the Contractor’s operations at any time that the Red River is navigable.

D16.5 Prior to commencing any works or operations involving the use of equipment in or above the river (work bridges construction, falsework or formwork, structural concrete, deck drain works, painting, and all other applicable operations incidental to the work of this contract), the Contractor must obtain in writing the clearance of the Winnipeg rivers and streams authority number one and of the Canadian coast guard (in accordance with the navigable waters protection act).

D16.6 The Contractor shall provide, install, and maintain adequate warning signs and lighting on the work bridges, cofferdams, work platforms, and bridge and buoys to notify boats and other craft navigating on the red river that construction is underway. These warnings shall meet the requirements of the Winnipeg rivers and streams authority number one and of the Canadian coast guard.

D16.7 Prior to commencing any applicable operations over the red river, the Contractor shall provide to the Contract Administrator a copy of all necessary approvals received by the Contractor.

D16.8 Notwithstanding the measurement and payment terms of Environmental Protection Plan – Waterways Permit during construction, including monitoring will be considered incidental to all Work.

D17. WATER MANAGEMENT PLAN

D17.1 Provide the Contract Administrator with a water management plan at least five (5) Business Days prior to commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D17.2 The Water Management Plan shall be prepared and submitted in a format that clearly identifies how the Contractor will undertake dewatering activities at the Site during construction if required.

D17.3 The Water Management Plan shall include provisions for sufficiently dewatering to maintain sufficiently dry conditions to undertake the Work. The Water Management Plan shall be further updated or altered as dictated by Site conditions. The Water Management Plan shall remain in effect until all construction and backfill activities are completed.

D18. SITE PLAN

D18.1 The Contractor shall provide the Contract Administrator with a Site 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.

D18.2 The Contractor shall submit a Site Plan for the Work to the Contract Administrator with:

(a) access points from public roads to laydown areas;

(d) construction access crossings of the rail lines (if any);

(e) fenced laydown area locations including gates;

(f) staging areas for various types of work (Undergrounds, Bridge, Roadworks, etc.);

(g) office facility locations with power supply, for both the Contractor and Contract; Administrator; and

(h) Haul roads to bring materials to the site and remove materials from the site.

SCHEDULE OF WORK

D19. COMMENCEMENT

D19.1 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.

D19.2 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 D7;

(ii) evidence of the workers compensation coverage specified in C6.17;

(iii) the Safe Work Plan specified in D8;

(iv) evidence of the insurance specified in D9;

(v) the contract security specified in D10;

(vi) the Subcontractor list specified in D11;

(vii) the Equipment list specified in specified in D12;

(viii) the detailed work schedule specified in D13;

(ix) the Environmental Protection Plan specified in D14; and

(x) the direct deposit application form specified in C12.20.

(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.

D19.3 The Contractor shall commence the Work on the Site no later than January 5, 2026.

D19.3 The City intends to award this Contract by December 19, 2025

D19.3.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D20. WORK BY OTHERS

D20.1 Further to C6.26, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working within the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of work, and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D20.2 Work by others on or near the Site will include but not necessarily be limited to:

(a) None the City is aware of at time of tendering

D20.2.1 Further to D20.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others identified in D20.1 or additional parties in their construction schedule as per D13 and accommodate the necessary area on Site required for the Work by Others to complete the Work

D21. DECLARATION OF PART 2 WORK PERIOD

D21.1 The Work of this Contract is divided into Part 1 and Part 2, as further defined in D2. Part 1 must be substantially completed by March 31, 2026.

D21.2 The Contractor shall, within seven (7) Calendar Days of the date of notification of the award of the Contract, submit a written declaration to the Contract Administrator stating their firm intention for the commencement and completion season of Part 2 of the Work. The declaration must select one of the following options:

(a) Parallel Completion: The Contractor will:
  (i) perform Part 2 concurrently with Part 1;
  (ii) there are no Critical Stages associated with this declaration;
  (iii) achieve Substantial Performance no later than March 31, 2026; and
  (iv) achieve Total Performance no later than June 30, 2026.

(b) Deferred Completion: The Contractor will:
  (i) complete Part 1 only by the Critical Stage by March 31, 2026
  (ii) defer Part 2 to the subsequent winter season (2026/2027);
  (iii) commence Part 2 Work no earlier than November 1, 2026;
  (iv) achieve Substantial Performance no later than March 31, 2027; and
  (v) achieve Total Performance no later than June 30, 2027.

D21.3 The Contractor's selected option in D21.2(a) or D21.2(b) shall become a binding term of the Contract. The dates for Critical Stages, Substantial Performance, Total Performance, and the assessment of Liquidated Damages for Part 2 shall be fixed based on the declared option and the schedule requirements stipulated in D22, D23, D24, and D25**,** as amended by this Declaration.

D21.4 Once a declaration for a specific winter season is made, the Contractor shall be fully bound to complete all in-water and seasonal works of Part 2 within that season, consistent with the navigation and environmental restrictions specified in the Supplemental Conditions.

D22. CRITICAL STAGES

D22.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) If the Contractor selects D21.2(a):

(i) There are no Critical Stages in the contract.

(b) If the Contractor selects D21.2(b):

(i) All Part 1 Works as identified in D2.2(a) and D2.3 shall be substantially completed by March 31, 2026, including removal of the temporary access berm.

D23. SUBSTANTIAL PERFORMANCE

D23.1 The Contractor shall achieve Substantial Performance by the date specified in the Contractor's binding declaration as follows:

(a) If the Contractor selects D21.2(a):

(i) The Contractor shall achieve Substantial Performance by March 31, 2026.

(b) If the Contractor selects D21.2(b):

(i) The Contractor shall achieve Substantial Performance by March 31, 2027.

D23.2 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.

D23.3 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.

D24. TOTAL PERFORMANCE

D24.1 The Contractor shall achieve Total Performance by the date specified in the Contractor's binding declaration as follows: D21

(a) If the Contractor selects D21.2(a):

(i) The Contractor shall achieve Total Performance by June 30, 2026.

(b) If the Contractor selects D21.2(b):

(i) The Contractor shall achieve Total Performance by June 30, 2027.

D24.2 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.

D24.3 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.

D25. LIQUIDATED DAMAGES

D25.1 If the Contractor fails to achieve Critical Stages, Substantial Performance, or Total Performance in accordance with the Contract by the day fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues.

(a) The Critical Stage as defined in D22.1(b)(i) – Two Thousand Five Hundred Dollars ($2,500.00)

(b) Substantial Performance – Two Thousand Five Hundred Dollars ($2,500.00)

(c) Total Performance - One Thousand Five Hundred Dollars ($1,500.00).

D25.2 The amount specified for liquidated damages in D25.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D25.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D26. JOB MEETINGS

D26.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D26.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

D27. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D27.1 Further to C6.27, 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).

D28. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D28.1 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.

D29. LAYOUT OF STRUCTURAL WORKS

D29.1 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. He shall provide all required instruments and competent personnel for performing all layouts.

D29.2 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.

D29.3 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at his own expense.

D29.4 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

PAYMENT

D30. FUEL PRICE ADJUSTMENT

D30.1 The Contract is subject to a fuel price adjustment which will be calculated monthly based on eligible Work completed utilizing the following mathematical formulas;

(a) where the price of fuel has increased - ((CFI/BFI)-1.15) x Q x FF; and

(b) where the price of fuel has decreased - ((CFI/BFI)-0.85) x Q x FF; where

(i) BFI = base fuel index

(ii) CFI = current fuel index

(iii) FF = fuel factor

(iv) Q = monetary value of Work applied in the calculation.

D30.1.1 Eligible Work will be determined in accordance with D30.5.

D30.1.2 The base fuel index (BFI) will be the retail price of fuel identified on the Submission Deadline based on latest published "Monthly average retail prices for gasoline and fuel by geography" for Winnipeg, published by Statistics Canada, Table 18-10-0001-01. The BFI is a blended rate based on 15% regular unleaded gasoline at self-service filling stations and 85% diesel fuel at self-service filling stations.

D30.1.3 The current fuel index (CFI) based on the above blended rate will be determined for each monthly progress estimate and applied on the following progress estimate as a change order once rates are published by Statistics Canada.

D30.1.4 A Fuel Factor (FF) rate of the monetary value of all eligible Work completed that month based on the Contract unit prices will be used to calculate the assumed apportioned cost of fuel.

D30.2 Fuel cost adjustments may result in additional payment to the Contractor or credit to the City within the Contract by way of a monthly change order.

D30.3 The fuel escalation or de-escalation adjustment will not be applied if the CFI is within ±15% of the BFI.

D30.4 Fuel escalation adjustments will not be considered beyond the Substantial Performance/Critical Stages except where those dates/Working Days are adjusted by change order. Fuel de-escalation adjustments will apply for Work that extends beyond the dates/Working Days specified for Substantial Performance/Critical Stages.

D30.5 The Fuel Factor (FF) rates will be set as follows:

(a) The Fuel Factor rate will be set at 1.9% of the monetary value for Payment Items corresponding to Specifications E8 to E18 identified on Form B: Prices related to bridges and structures Work.

WARRANTY

D31. WARRANTY

D31.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

INDEMNITY

D32. INDEMNITY

D32.1 Indemnity shall be as stated in C17.

FORM J: SUBCONTRACTOR LIST
(See D11)

LOUISE BRIDGE SUBSTRUCTURE REHABILITATION WORK – PHASE 1

Portion of Work	Name	Address

FORM K: EQUIPMENT
(See D17)

LOUISE BRIDGE SUBSTRUCTURE REHABILITATION WORK – PHASE 1

Category/type: Temporary Berm Placement Removal

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

Category/type: Pile Foundations *Earth Moving/Excavation*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

Category/type: Temporary Bridge Jacking *Base Placement / Compaction / Grading*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

E1.2 *The City of Winnipeg Standard Construction Specifications* in 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/Spec/Default.stm

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

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

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

E1.4 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
B107-25-001	COVER SHEET
B107-25-002	LIST OF DRAWINGS AND DESIGN DATA
B107-25-003	GENERAL ARRANGEMENT AND SCOPE OF WORK
B107-25-004	TEMPORARY WORKS
B107-25-005	PROPOSED PIER CONSTRUCTION SEQUENCE OF WORK
B107-25-006	SOUTH ABUTMENT SU.1 AND SU.5 BEARING PLAN AND JACKING PROCEEDURE
B107-25-007	SU.1 BEARING REPLACEMENT DETAILS
B107-25-008	SU.5 BEARING REPLACEMENT DETAILS
B107-25-009	PIER SU.2 AND SU.4 SHEET PILES LAYOUT AND DETAILS
B107-25-010	PIER SU.2 AND SU.4 PILING LAYOUT AND DETAILS
B107-25-011	PIER SU.2 CONCRETE DETAILS
B107-25-012	PIER SU.4 CONCRETE DETAILS
B107-25-013	PIER SU.2 REINFORCING DETAILS SHEET 1 OF 5
B107-25-014	PIER SU.2 REINFORCING DETAILS SHEET 2 OF 5
B107-25-015	PIER SU.2 REINFORCING DETAILS SHEET 3 OF 5
B107-25-016	PIER SU.2 REINFORCING DETAILS SHEET 4 OF 5
B107-25-017	PIER SU.2 REINFORCING DETAILS SHEET 5 OF 5
B107-25-018	PIER SU.4 REINFORCING DETAILS SHEET 1 OF 4
B107-24-019	PIER SU.4 REINFORCING DETAILS SHEET 2 OF 4
B107-25-020	PIER SU.4 REINFORCING DETAILS SHEET 3 OF 4
B107-25-021	PIER SU.4 REINFORCING DETAILS SHEET 4 OF 4
B107-25-022	BILL OF REINFORCING
B107-25-023	BILL OF REINFORCING

E2. INVESTIGATION REPORTS

E2.1 Further to C3.1, Appendix A contains a letter of advice on the preliminary design recommendations for the Micro Piles that may be considered in the Contractor's design of the micro piles. Appendix C contains pier core hole results taken at SU2 and SU4.

E3. SHOP DRAWINGS

E3.1 Description

E3.1.1 This Specification provides instructions for the preparation and submission of Shop Drawings.

E3.1.2 This Specification shall revise, amend, and supplement the requirements of CW 1110.

E3.1.3 The Contractor shall provide all Submittals and Shop Drawings required in the Contract as well as any additional Submittals reasonably requested by the Contract Administrator, at the Contractor's expense.

E3.1.4 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work.

E3.1.5 Original drawings are to be prepared by the Contractor, subcontractor, supplier, distributor, or manufacturer, which illustrate the appropriate portion of Work; showing fabrication, layout, setting, or erection details as specified in appropriate sections.

E3.1.6 Shop Drawings are required for the following components:

(a) Design and details of Temporary Access Berms;

(b) Sheet Piling;

(c) Design and Details of Micro Piles;

(d) Temporary Jacking and Support of Superstructure

(e) Bearing Installation

(f) Pier Ice Breaker Nosing

E3.2 Scope of Work

E3.2.1 The Work under this Specification shall include review of Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

E3.2.2 The Contractor shall provide all Submittals and Shop Drawings required in the Contract as well as any additional Submittals reasonably requested by the Contract Administrator, at the Contractor's expense.

(a) field measurements;

(b) field construction criteria;

(c) catalogue numbers and similar data.

E3.2.3 Coordinate each shop drawing submission with the requirements of the Work and Contract Documents. Shop Drawings of separate components of a larger system will not be reviewed until all related drawings are available.

E3.2.4 Notify Contract Administrator, in writing at time of shop drawing submission, of deviations from requirements of Contract Documents.

E3.2.5 Responsibility for deviations in Shop Drawing submission from requirements of Contract Documents is not relieved by the Contract Administrator's review of submission, unless the Contract Administrator gives written acceptance of specified deviations.

E3.2.6 Responsibility for errors and omissions in the shop drawing submission is not relieved by the Contract Administrator's review of the submittals.

E3.2.7 The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on the previous submission.

E3.2.8 After the Contract Administrator has reviewed and returned the copies, distribute the copies to sub-trades as appropriate.

E3.2.9 Maintain one (1) complete set of reviewed Shop Drawings, filed by Specification section number, at the Site for use and reference by the Contract Administrator and Subcontractors.

E3.3 Submittals

E3.3.1 The Contractor shall schedule submittals at least ten (10) Business Days prior to when reviewed submittals will be needed and allow for a five (5) Business Day period for review by the Contract Administrator or each individual submission and re-submission, unless otherwise noted in the Contract.

E3.3.2 Submit one (1) electronic PDF of Shop Drawings.

E3.3.3 Further to CW 1110, all submissions must be in metric units. Where data is in imperial units, the correct metric values shall also be shown on the submissions for Contract Administrator review.

E3.3.4 Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

E3.3.5 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions, and review of Shop Drawings.

E3.3.6 Only two (2) reviews of Shop Drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator's scheduled rates and at the discretion of the Contract Administrator. The Contract Administrator's charges for the additional Work will be deducted from the Contractor's Progress Certificates.

E3.3.7 Accompany shop drawing submissions with a transmittal letter containing:

(a) Date;

(b) project title and bid opportunity number;

(c) Contractor's name and address;

(d) number of each Shop Drawing, product data, and sample submitted;

(e) specification section, title, number, and clause;

(f) drawing number and detail/section number;

(g) other pertinent data.

E3.3.8 Shop drawing submissions shall include:

(a) date and revision dates;

(b) project title and bid opportunity number;

(c) name of:

(i) Contractor;

(ii) Subcontractor;

(iii) supplier;

(iv) manufacturer;

(v) separate detailer when pertinent.

(d) identification of product or material;

(e) relation to adjacent structure or materials;

(f) field dimensions, clearly identified as such;

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

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

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

E3.3.9 Shop Drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

(a) All Formwork Details, as requested by the Contract Administrator;

(b) Those required as outlined in the following specifications.

E3.4 Equipment

E3.4.1 General

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

E3.5 Measurement and Payment

E3.5.1 Shop Drawings will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E3.5.2 Material and equipment delivered to the Site will not be paid for until pertinent Shop Drawings have been submitted and reviewed.

E3.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

GENERAL REQUIREMENTS

E4. MOBILIZATION AND DEMOBILIZATION PAYMENT

E4.1 Description

E4.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site as specified herein.

E4.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E4.1.3 The inclusion of a payment item for the Work under this Specification shall not release or reduce the responsibilities of the Contractor under any other specification in this Contract.

E4.2 References

E4.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision.

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

(b) CW 1130 – Site Requirements;

(c) Specification E5, Office Facilities;

(d) Specification E6, Traffic Control;

(e) SpecificationE7, Traffic Management;

E4.3 Scope of Work

E4.3.1 The Work under this Specification shall include but not be limited to:

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

(b) Supplying, setting up, layout out, and removing site office facilities as detailed in Office Facilities (E5).

(c) Supplying and installing secure fencing/gates for portions of the laydown areas the Contractor wishes to secure;

(d) Maintaining and removing any access roadways as needed into the laydown areas;

(e) Traffic Control (E6), and Traffic Management (E7);

(f) Premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable;

(g) General cleanup and housekeeping needed maintain a neat and orderly project site;

(h) Other related job items.

E4.4 Submittals

E4.4.1 The Contractor shall submit the following to the Contract Administrator seven (7) Calendar Days prior to mobilization on Site:

(a) A plan highlighting the Site layout which includes: laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits and gate locations for review and approval.

E4.5 Materials

E4.5.1 General

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

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

E4.6 Equipment

E4.6.1 General

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

E4.7 Construction Methods

E4.7.1 Layout of On-Site Work Facilities

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

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

E4.7.2 Site Security

(a) The Contractor has discretion on what areas of the site they wish to secure. This may include the Contractor’s lay down area, material storage areas, and/or access roads. These areas may be fenced and gated for security and to discourage pedestrian entrance to construction areas and to control any potential hazard to the public, particularly children. The Contractor shall not fence off areas where public traffic or pedestrians need to travel, such as open roadway lanes or sidewalks/bike paths.

E4.7.3 Access Roadway

(a) The Contractor shall note the laydown areas shown available on the Drawings.

(b) When the Contractor wishes to install an access along a laydown border marked "Contractor Laydown Area – Access", they shall make a written request to the Contract Administrator before commencing construction. The Contract Administrator shall have two (2) Business Days to review and respond to the request.

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

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

E4.7.4 Restoration of Existing Facilities

(a) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities to their original condition, to the approval of the Contract Administrator.

E4.8 Quality Control and Assurance

E4.8.1 Inspection

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

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

E4.8.2 Access

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

E4.9 Measurement and Payment

E4.9.1 Mobilization and Demobilization

(a) "Mobilization and Demobilization" will not be measured. This Item of Work will be paid for at a percentage of the Contract Lump Sum Price, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator. These percentages shall be as follows:

(i) when Contract Administrator is satisfied that construction has commenced on Part 1 Work thirty percent (30%) of Part 1;

(ii) when Contract Administrator is satisfied that construction has commenced on Part 2 Work thirty percent (30%) of Part 2;

(iii) during construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator of sixty percent (60%) of Part 1 and Part 2;

(iv) upon Total Performance ten percent (10%) of Part 1 and Part 2.

(b) Note that "Mobilization and Demobilization" applies to Work of the project in Parts and is listed for measurement and payment separately under Part 1 and Part 2 of Form B: Prices.

E5. OFFICE FACILITIES

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

(a) The field office shall be for the exclusive use of the Contract Administrator.

(b) The building shall be conveniently located near the site of the Work.

(c) The building shall have a minimum floor area of 37 square metres, a height of 2.4 meters. Each building shall have two (2) windows for cross ventilation and a door entrance with a suitable lock.

(d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18^{o}C or 24-25^{o}C.

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

(f) The building shall be furnished with two (2) desks with chairs, one (1) drafting table with a stool, a table with chairs suitable to seat at least fifteen (15) people at a time for meetings, one (1) four (4) drawer, lockable legal size filing cabinet, and a minimum of ten (10) chairs;

(g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.

(h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when they deem it necessary.

(i) High-Speed Internet for Contract Administrator use.

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

E5.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance is completed.

E5.4 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.

E5.5 Measurement and Payment

E5.5.1 Office Facilities will be considered incidental to Mobilization and Demobilization. No separate measurement or payment shall be made for the work associated with this Specification.

E6. TRAFFIC CONTROL

E6.1 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.

(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.

E6.2 Further to (c), the Contractor shall make arrangement with the Traffic Services Branch of the City of Winnipeg to supply regulatory signs as required.

E6.3 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the Site has been maintained.

E6.4 Further to E6.1(c) and E6.1(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.

E6.5 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.

E6.6 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.

E6.7 Measurement and Payment

E6.7.1 Traffic Control will be considered incidental to the Mobilization and Demobilization. No separate measurement or payment shall be made for the work associated with this Specification

E7. TRAFFIC MANAGEMENT

E7.1 Description

E7.1.1 This Specification shall cover all operations relating to Traffic Management.

E7.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E7.2 References

E7.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CW 1130

E7.3 Scope of Work

E7.3.1 Pedestrian and vehicular traffic shall be maintained throughout the duration of the project except as noted below or otherwise approved by the Contract Administrator.

E7.3.2 Temporary closures of the bridge to vehicular traffic is required to undertake the temporary superstructure jacking and bearing installation at the South Abutment SU1 and at Pier SU5 in accordance with E16 and as set out below.

(a) One vehicular bridge closure of up to seven (7) calendar days is acceptable for each of the Part 1 and Part 2 Works.

(b) Vehicular Bridge Closures will be undertaken by the City of Winnipeg Traffic Services Branch. The Contractor is required to provide a minimum of two weeks notice ahead of the desired closure.

(c) At least one sidewalk shall remain open at all times for pedestrian and cyclist access.

(d) The Contractor shall be responsible for any localized traffic signing and pedestrian wayfinding signage.

E7.4 Measurement and Payment

E7.4.1 Traffic Management will be considered incidental to Mobilization and Demobilization. No separate measurement or payment shall be made for the work associated with this Specification

E8. TEMPORARY ROCK ACCESS BERMS

E8.1 Description

E8.1.1 General

(a) This Specification will cover all operations related to the design, installation, maintenance, and removal to temporary rock access berms.

(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.

E8.2 References.

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision. References include but may not be limited to:

(i) Section D19, Environmental Protection Plan

(ii) Appendix B, Fisheries Act Authorization

(iii) Appendix C, Waterway Permit

E8.3 Scope of Work

E8.3.1 The Work under this Specification shall involve the following:

(a) Design of the temporary rock access berms.

(i) The maximum platform dimensions to facilitate piling and pier encapsulation operations are as shown on the drawing unless otherwise approved by the Contract Administrator.

(ii) Clean 50 mm rock fill is shown on the drawings in the zone of sheet pile to facilitate sheet piling installation. The contractor may elect to propose an alternate material to drive the sheet pile through, subject to approval by the Contract Administrator.

(iii) The platforms may be constructed in stages to facilitate micro pile installation as shown on the drawings.

(iv) Considerations shall include slope stability of the temporary rock berm. The effects of rock berm on stability of the riverbank will be reviewed by the Contract Administrator upon submission of the Contractor's proposed temporary rock access berms.

(b) Construction of the temporary rock berm.

(c) Maintenance of the temporary rock berms through the pier construction operations.

(d) Removal of the temporary rock berms.

(i) The temporary rock access berms must be removed by March 31, 2026, in accordance with the Fisheries Act Authorization. No in-water works shall occur between April 1 and July 15 in any given year. The contractor is advised that breakup of the river often occurs by March 15th with spring flooding possible. The removal of the temporary rock berm by March 15th may be required due to prevailing river conditions. Historical daily river levels are available on the City website here: https://www.winnipeg.ca/services-programs/water-wastewater/flooding-0/current-river-levels. The contractor is encouraged to review the historical spring flooding levels while developing the construction schedule.

(ii) Should Part 2 Work in D3.2(b) be deferred to the fall/winter of 2026/2027 additional Fisheries Act Authorization will be obtained by the Contract Administrator.

(iii) Proper removals of temporary rock access within the given timelines are not expected to affect navigation on the Red River.

(e) Any other activities to complete the Works.

E8.4 Schedule

(a) In no case may a temporary rock berm exist between March 31 and November 1 of any calendar year.

E8.5 Submittals

(a) The temporary rock access berm shall be designed by, prepared by, and bear the seal and signature of a Professional Engineer (Design Engineer) registered in the Province of Manitoba. Detailed drawings, specifications and design notes for the temporary access berm, bearing the seal and signature of the Design Engineer shall be submitted by the Contractor to the Contract Administrator at least five (5) business days prior to the start of any protection system installation in accordance with Specification E2 “Shop Drawings” allowing three (3) business days for review by the Contract Administrator. The submission of the temporary rock access berms detailed drawings, specifications and design notes to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the design and safe and effective functioning of the temporary rock access berm.

E8.6 Materials

E8.6.1 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) 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.

E8.6.2 Temporary Rock Access Berm

(a) The temporary rock access berms shall be constructed using crushed rock that is clean of debris and free of fines and organics. Material used as a levelling course on the temporary access berms shall be clean granular material and not a composite material.

(b) To facilitate sheet pile installation, 50 mm clean rock has been identified for driving sheets through. The Contractor may propose alternative clean material, subject to approval by the Contract Administrator.

E8.7 Equipment

E8.7.1 General

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

E8.8 Construction Methods

E8.8.1 General

(a) The Contractor shall undertake the installation, maintenance, and removal of the temporary rock access berms in accordance with the approved submission of design in a careful and workmanlike manner so as to ensure the existing bridge components and permanent Works are not damaged.

(b) Part 2 temporary rock access berms may be constructed and in place at the same time as Part 1 temporary rock access berms only if the Contractor declares that all in-

water works and removals will be completed by March 31, 2026, in accordance with D21.

(c) The Contractor shall be responsible for maintaining slope stability of the temporary access berms and the permanent riverbanks to the satisfaction of the Contract Administrator. If required the Contractor may need to make adjustments to the staging of the construction of the temporary rock berm or may have to construct additional access platforms, ramps and/or toe berms for equipment.

(d) The Contractor shall be responsible for fully removing all temporary in-water rock access berms by March 31 of each year.

(e) The Contractor is advised that breakup of the river often occurs by March 15th, with spring flooding possible. The removal of the temporary rock berm sooner than March 31 may be required due to prevailing river conditions. Historical daily river levels are available on the City website here: https://www.winnipeg.ca/services-programs/water-wastewater/flooding-0/current-river-levels. The Contractor is encouraged to review the historical spring flooding levels while developing the construction schedule.

(f) No fuel or other hazardous materials shall be stored on temporary access berms.

E8.9 Measurement and Payment

(a) "Temporary Rock Access Berms" will not be measured. This Item of Work will be paid for at a percentage of the Contract Lump Sum Price for Part 1 and Part 2 separately, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator. These percentages shall be as follows:

(i) when Contract Administrator is satisfied that the Part 1 or Part 2 Temporary Access Berm has been installed to commence sheet piling forty percent (40%);

(ii) when Contract Administrator is satisfied that construction of the Part 1 or Part 2 temporary access berm has been completed to commence micro-piling, thirty percent (30%);

(iii) upon complete removal of the temporary access berm for Part 1 or Part 2 to the satisfaction of the Contract Administrator, thirty percent (30%).

E9. SHEET PILING

E9.1 Description

E9.1.1 This Specification covers all operations related to the construction of steel sheet pile surrounding each pier.

E9.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E9.2 Submittals

E9.2.1 Certificates

(a) At least two (2) weeks prior to start of pile driving, submit to the Contract Administrator, two (2) copies of steel producer mill test data and certification that steel piling, delivered to job site, meets requirements of this Section and is in accordance with CAN/CSA-G40.20-13.

E9.3 Materials

E9.3.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

E9.3.2 Steel Sheet Piles: To CAN/CSA-G40.21-13 (including chemical and mechanical requirements), Grade 350W, and following:

(a) Continuous interlocking, flat web with minimum web thickness 13.3mm and minimum mass of 155.4 kg/m2.

(b) Continuous interlocking (Z) section:

(c) Minimum effective section modulus of 2600 cm^3 per metre of wall.

(d) Minimum flange thickness of 15.2mm.

(e) Minimum web thickness of 13.3mm.

(f) Sheet Piling: As manufactured by Nucore, section designation NZ 26 or in accordance with B8 by Contract Administrator.

(g) Special Corners: Shop fabricate by welding or provide standard fabricated special corner connectors for type of steel piling supplied.

(h) Interlocks: Section of interlock bar of 1m minimum length which will pass along full length of pile without binding.

(i) Mark each piece of sheet piling legibly by stencilling or die-and-stamping with the following information:

(i) Heat Number

(ii) Manufacturer's Name

(iii) Length and Section Number

(j) Do not precut lifting or slinging holes in sheet piles.

E9.4 Construction Methods

E9.4.1 Delivery, Handling and Storage

(a) Use slings for lifting piling so that mass is evenly distributed and piling is not subjected to excessive bending stresses.

(b) Store sheet piling on level ground or provide supports so that sheet piling is level when stored. Provide blocking at spacing not exceeding 5m so that there is no excessive sagging in piling. Overhang at ends not to exceed 0.5m. Block between lifts directly above blocking in lower lift.

(c) If material is stockpiled on structure, ensure that the structure is not overloaded.

E9.4.2 Installation

(a) Welding to be in accordance with CSA W59 except where specified otherwise.

(b) Pile installation is not to commence until all required quality control tests have been completed and test results approved by the Contract Administrator.

(c) For installation of sheet piles, provide installation equipment capable of installing sheet pile to elevations indicated.

(d) Submit full details of method and sequence of installation of piling to Contract Administrator for approval prior to start of pile installation work. Details must include guide frames and bracing if required, setting and driving sequence and number of piles in panels for driving.

(e) Do not drive sheet piles within a radius of 8 metres of concrete which has been in place for a time shorter than 3 days unless authorized by the Contract Administrator.

(f) Remove loose and displaced material from around sheet piles after completion of driving, and leave clean, solid surfaces to receive backfill.

(g) Provide sufficient length above cut-off elevation so that part damaged during driving is cut off. Cut off sheet piles neatly and squarely at elevations indicated.

(h) When installation is complete, face of wall at top of sheet piles to be within 25mm of location as indicated and deviation from batter not to exceed 1 in 100.

(i) If, in the opinion of the Contract Administrator, piles are placed beyond tolerances specified, the Contractor may be required to remove such piles and install new piles to the specified tolerances at his own expense.

(j) Remove cut-off lengths from site on completion of work.

(k) Stud weld nelson studs as shown on the construction drawings.

E9.4.3 Obstructions

(a) If an obstruction is encountered during driving, leave obstructed pile and proceed to drive remaining piles. Return and attempt to complete driving of obstructed pile later.

(b) Advise the Contract Administrator immediately if impossible to drive pile to full penetration, and obtain direction from Contract Administrator on further steps required to complete work.

E9.4.4 Cutting

(a) When flame cutting tops of piles and flame cutting weep holes in piles, adopt the following procedure:

(b) When air temperature is above 0^{o}C, no pre-heat is necessary.

(c) When air temperature is below 0^{o}C, pre-heat until steel 25mm on each side of line of cut has reached a temperature very warm to hand (approximately 35^{o}C). Tempilstiks@ or temperature indicating crayon marks may be used to measure temperature.

(d) Use torch guiding device to ensure smooth round holes or straight edges.

(e) Make cut smooth and free from notches throughout thickness. If grinding is employed to remove notch or crack, finished radius to be minimum 5mm.

E9.4.5 Splicing

(a) Use full length piles unless splicing is indicated or unless approved by Contract Administrator.

E9.5 Quality Control

E9.5.1 Source Quality Control: Hot Rolled Steel Sheet Piling

(a) Provide results of tests of sheet piling material to be used on project as follows:

(i) One tension test (and 1 bend test) from each heat for quantities of finished material less than 50 tonnes.

(ii) Two tension tests (and 2 bend tests) from each heat for quantities of finished material exceeding 50 tonnes.

(b) Tension tests in accordance with CAN/CSA-G40.20-13; (bend tests in accordance with ASTM-A6/A6M-13).

E9.5.2 Quality Assurance

(a) Inspection and testing of steel sheet piling material to be carried out by testing laboratory designated by the Contract Administrator at any time during the course of the Work.

(b) Materials inspected or tested by the Contract Administrator which fail to meet Contract requirements will be rejected at any time in course of work.

(c) Where tests or inspections by designated testing laboratory reveal work not in accordance with Contract requirements, Contractor to pay costs for additional tests or inspections as Contract Administrator may require to verify acceptability of corrected work.

E9.6 Measurement and Payment

E9.6.1 Supplying and Driving Steel Sheet Piles

(a) Supply and driving of steel sheet piles will not be measured. This Item of Work shall be paid for per Parts 1 and 2 at the Contract Lump Sum Price for “Supply and Driving Steel Sheet Piles”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

(b) Splicing of piles including welded connections of angles and plates at bend lines shall be incidental to the Works.

E10. MASONRY PIER SHAFT PREPARATION

E10.1 Description

E10.1.1 This Specification shall cover all operations relating to:

(a) The preparation of the existing masonry pier shaft preparation including removal of existing reinforced concrete collars, removal of loose or fractured stone and cleaning of the surfaces, as specified herein and as shown on the Drawings.

(b) Structural removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling, dismantlement, and disposal of applicable materials.

E10.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E10.2 References

E10.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) D14 Environmental Protection Plan;

(b) E12 Supply and Placing Reinforcing Steel;

(c) E13 Drilling and Placing Dowels;

(d) E14 Structural Concrete;

(e) ICRI Guideline No. 03732.

E10.2.2 Details of the Existing Structure

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

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

E10.3 Scope of Work

E10.3.1 The Work under this Specification shall specifically include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(a) Concrete Removals as follows:

(i) Complete partial removal and disposal of the reinforced concrete collar at the base of SU2 and SU4 as identified on the Drawings;

(b) Limestone masonry block preparation as follows:

(i) Hammer sounding of the existing masonry block including partial removal of fractured and loosened portions of limestone blocks as directed by the Contract Administrator to create a sound durable substrate.

(ii) Sandblast the remaining limestone block surface to remove dirt, debris and micro-fractured surfaces.

(c) Completing all structural removals with appropriate equipment satisfactory to the Contract Administrator. All demolition products shall be removed from the site with hazardous products captured and disposed of in accordance the approved plan under D14, Environmental Protection Plan. Under no circumstances shall demolition products find their way into the watercourse;

(d) Providing saw cuts as shown on the Drawings and where otherwise necessary to limit the extent of demolition;

(e) Repairing any over demolition and damage to reinforcing steel or other structural components to the satisfaction of the Contract Administrator;

(f) Complying with any and all environmental requirements identified in the Specifications or otherwise applicable to the proposed Works;

(g) All materials not identified for salvage shall be disposed of at an approved disposal facility by the Contractor. Any disposal fees shall be considered incidental to this Work.

E10.4 Submittals

E10.4.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any removal Works on Site, a detailed removal plan and schedule clearly illustrating the method and sequence by which the Contractor proposes to perform the concrete collar removals and masonry block surface preparation including a description of the measures that will be implemented to meet the applicable environmental requirements identified in D14, Environmental Protection Plan.

E10.5 Materials

E10.5.1 General

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

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

E10.6 Equipment

E10.6.1 General

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

(b) The use of explosives is prohibited.

E10.6.2 Demolition Barriers

(a) The Contractor shall provide all necessary temporary barriers or enclosures to ensure demolition products do not make the way into the watercourse. The barriers shall not impede the concrete removals process or associated inspection of all Works by the Contract Administrator.

E10.6.3 Sequence Of Structural Removals

(a) Construction sequencing of all structural removals shall take place as shown on the Drawings.

E10.7 Construction Methods

E10.7.1 General

(a) Masonry pier shaft preparation work shall be deemed to include all the items of work identified herein as shown on the Contract Drawings or otherwise directed by the Contract Administrator.

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

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

(d) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures. Limits of demolition shall be straight and saw-cut to provide a clean edge at the extent of demolition.

(e) The Contractor shall generally prevent any unspecified and undesirable movement or settlement of the existing structure or damage to the existing structure. The Contractor shall design and provide any bracing, shoring or underpinning necessary to complete the work as required and shall have any designs for this Work sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba. If the safety of the structure and/or existing services appears to be endangered during structural removal operations or if the Work is detrimentally impacting the environment, the Contractor shall cease operations and notify the Contract Administrator immediately. Additionally, if the Work is proceeding in a fashion unsatisfactory to the Contract Administrator for any reason, the Contractor will be notified and shall cease operations immediately.

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

(g) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.

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

(i) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any neighbouring roadways or sidewalks during removal or transporting operations.

(j) The Contractor shall visit the Site to become familiar with the existing conditions and scope of work prior to bid submission. No allowance for extras will be made for any structural removals, not foreseen by the Contractor, required to complete the scope of Work.

(k) The Contractor shall provide all necessary access to facilitate concrete removals and subsequent inspection of all the Works by the Contract Administrator.

(l) Following the initial removal of concrete, the Contract Administrator will conduct a delamination survey to determine if any additional concrete removal will be required. These areas will be clearly marked out by the Contact Administrator for the Contractor’s completion of delamination repairs.

(m) In the case that reinforcing is exposed during the concrete removal operations the following shall be adhered to:

(i) Any reinforcing steel that is severed shall be replaced, with appropriate lap lengths, by the Contractor to the satisfaction of the Contract Administrator at no additional cost to the City.

(ii) Any reinforcing steel that exhibits minor cross-sectional loss or other loss of epoxy coating shall receive a coat of one hundred percent (100%) solids, non-conductive epoxy installed as per the manufacturer's specifications.

(n) Construction methods specific to the removal of each bridge component are provided in the following Clauses.

E10.7.2 Concrete Removals

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

(b) The concrete collars shall be removed to the limits indicated on the drawings.

(c) The partial concrete collar removal as the micro-pile location below the proposed base slab is solely required to facilitate the micro-pile installation. The Contractor shall propose demolition methods that will minimize damage to the existing limestone masonry as approved by the Contract Administrator.

E10.7.3 Limestone Masonry Block Surface Preparation

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

(b) The Contractor shall inspect the existing limestone block pier surfaces and hammer sound the face. Any limestone rock that if fractured but reasonably sound may stay in place.

(c) Limestone rock that is fractured but loose shall be removed.

(d) Friable and loose surfaces shall be removed down to sound rock.

(e) The entire pier shaft surface shall be cleaned of dirt and debris by sandblasting.

E10.7.4 Waste Handling and Disposal of Removed Materials

(a) Dispose of all surplus and unsuitable material off-site, in accordance with D14 Environmental Protection Plan.

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

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

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

E10.8 Quality Control and Assurance

E10.8.1 Inspection

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

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

E10.8.2 Access

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

his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E10.9 Measurement and Payment

E10.9.1 Masonry Pier Shaft Preparation

(a) Masonry Pier Shaft Preparation will not be measured. Masonry Pier Shaft Preparation will be paid for per Parts 1 and 2 at the Contract Lump Sum Prices for the "Masonry Pier Shaft Preparation", which price shall be payment in full for supplying all materials, equipment 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.

E11. MICRO PILES

E11.1 Description

(a) This section includes the requirements for the design, supply, installation and testing of grouted micro piles for the underpinning of bridge piers.

E11.2 Definitions:

(a) **Admixture:** Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.

(b) **Alignment Loa**d (AL): An initial load applied to micropile during testing to keep the testing equipment correctly positioned (Typically 5% maximum test load).

(c) **Bonded Length:** The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.

(d) **Bond-breaker:** A sleeve placed over the steel reinforcement to prevent load transfer.

(e) **Casing:** Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.

(f) **Centralizer:** A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.

(g) **Creep Movement:** The movement that occurs during the creep test of a micropile under a constant load.

(h) **Design Load (DL):** The maximum ULS factored load expected to be applied to the micropile during its service life.

(i) **Coupler:** The means by which load capacity can be transmitted from one partial length of reinforcement to another.

(j) **Duplex Drilling:** Means a drilling system involving simultaneous rotation and advancement of (inner) drill rod and (outer) drill casing in which the cuttings from the inner drill rod exit the borehole via the annulus between the rod and the casing.

(k) **Elastic Movement:** Means the recoverable movement measured during Micropile test.

(l) **Encapsulation:** A corrugated or deformed tube protecting the reinforcing steel against corrosion.

(m) **Free (Unbonded) Length:** The designed length of the micropile that is not bonded to the surrounding ground or grout.

(n) **Geotechnical Bond Design Strength:** For Ultimate Limits States (ULS) or Load Factor Design (LFD), computed as the nominal grout-to-ground bond strength multiplied by a geotechnical resistance factor φg. Use:

(i) $\varphi_g = 0.4$ for compression loading

(ii) φ_g = 0.3 for tension loading

(o) **Maximum Test Load:** The maximum load to which the micropile is subjected during testing

(p) **Micropile:** A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.

(q) **Nominal Grout-to-Ground Bond Strength:** The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design.

(r) **Overburden:** Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.

(s) **Post-grouting:** The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouting or secondary grouting.

(t) **Primary Grout:** Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.

(u) **Pre-Production Micropile:** Means a sacrificial Micropile that is not part of the final foundation system and is subjected to load testing to verify the design and installation procedures.

(v) **Production Micropile:** Means a Micropile that forms part of final foundation support system to structure.

(w) **Proof Load Test:** Incremental loading of a production micropile, recording the total movement at each increment.

(x) **Reinforcement:** The steel component of the micropile that accepts and/or resists applied loadings. This includes central steel bar and permanent steel casing used in this Contract.

(y) **Residual Movement:** Means the non-elastic (non-recoverable) movement of a Micropile measured during load testing

(z) **Sheathing:** Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.

(aa) **Spacer:** A device to separate elements of a multiple-element reinforcement.

(bb) **Ultimate Grout-To-Ground Bond Value:** Means the estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design.

(cc) **Ultimate Load (UL):** Micropile load corresponding to the nominal grout-to-ground bond strength for the pile configuration and dimensions.

(dd) **Verification Load Test:** Pile load test performed to verify the design of the pile system and the construction methods proposed, prior to installation of production piles. Test piles are typically constructed to full scale or may be scaled for practical testing purposes.

E11.3 References

The following standards shall govern the minimum quality of work required under this Section. All standard references shall be to the latest edition.

(a) Standards listed below govern minimum quality of work required under this Section:
American Society of Civil Engineering (ASCE):

(i) ASCE 20-96 “Standard Guidelines for the Design and Installation of Pile Foundations”

(b) ASTM International Inc.

(i) ASTM A252/SA252 “Welded and Seamless Steel Pipe Piles”

(ii) ASTM A 307-14 “Standard Specification for Carbon

(iii) Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength”.

(iv) ASTM A 325-14 “Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength”

(v) ASTM A 325M-14 “Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)”

(vi) ASTM A 490M-14a “Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)”

(vii) ASTM A521/A521M-06 “Standard Specification for Steel, Close Impression Die Forgings for General Industrial Use”

(viii) ASTM A572,”High-Strength Low-Alloy Columbium-Vanadium Structural Steel”

(ix) ASTM A615 “Deformed and Plain Billet Steel Bars for Concrete Reinforcement”

(x) ASTM A 722/A722M-07 “Standard Specification for Uncoated High Strength Steel Bar for Prestressing Concrete”

(xi) ASTM A775 “Epoxy -Coated Reinforcing Steel Bars”

(xii) ASTM A934 “Epoxy-Coated Prefabricated Steel Reinforcing Bars”

(xiii) ASTM A 1011/A 1011M-14 “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength”

(xiv) ASTM C33 “Concrete Aggregates”

(xv) ASTM C109 “Compressive Strength of Hydraulic Cement Mortar”

(xvi) ASTM C144 - Aggregate for Masonry Mortar

(xvii) ASTM C150 “Portland Cement”

(xviii) ASTM C188 “Density of Hydraulic Cement”

(xix) ASTM C494 “Chemical Admixtures for Concrete”

(xx) ASTM D1143D/D1143M “Standard Test Method for Deep Foundations under Static Axial Compressive Load”

(xxi) ASTM D 1748-22 “Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds”

(xxii) ASTM D3350 “Polyethylene Corrugated Tubing”

(xxiii) ASTM D3689 “Standard Test Method for Deep Foundations Under Static Axial Tensile Load”

(xxiv) ASTM D 3966/D 3966M-07(2013)E1 “Standard Test Methods for Deep Foundations Under Lateral Load”

(xxv) ASTM D 3689/D 3689M-07(2013)E1 “Standard Test Methods for Deep Foundations Under Static Axial Tensile Load

(xxvi) ASTM D 3740-12a “Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction”

(xxvii) ASTM D 4945-12 “Standard Test Method for High-Strain Dynamic Testing of Deep Foundations”

(c) Canadian General Standards Board (CGSB)

(i) CAN/CGSB-85.10-99, “Protective Coatings for Metals”

(d) Canadian Geotechnical Society Publications:

(i) CSA S6-25 “Canadian Highway Bridge Design Code”

(ii) CSA A23.1/A23.2 “Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practice for Concrete.

(iii) CSA A283 Qualification Code for Concrete Testing Laboratories

(iv) CSA A3000 Cementitious Materials Compendium

(v) CSA G30.18 “Carbon Steel Bars for Concrete Reinforcement”

(vi) CSA G40.20-13/G40.21-13 “General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel”

(vii) CSA-S16-24 “Limit States Design of Steel Structures”

(viii) CSA W47.1 “Certification of Companies for Fusion Welding of Steel”

(ix) CSA W48 “Filler Metals and Allied Materials for Metal Arch Welding”

(x) CSA W59 “Welded Steel Construction (Metal Arch Welding)”

(xi) CSA W186-M1990 “Welding of Reinforcing Bars in Reinforced Concrete Construction”

(e) The Canadian Geotechnical Society

(i) CFEM, “Canadian Foundation Engineering Manual”

(f) Deep Foundations Institute (DFI):

(i) Guide to Drafting a Specification for High Capacity Drilled and Grouted Micropiles for Structural Support, 1st Edition, Copyright 2001 by the Deep Foundation Institute

(g) Master Painters Institute

(i) MPI-INT 5.1-08 “Structural Steel and Metal Fabrications”

(ii) MPI-EXT 5.1-08 “Structural Steel and Metal Fabrications”

(h) Post Tensioning Institute Publications:

(i) Recommendations for Prestressed Rock and Soil Anchors

(i) The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International

(i) SSPC-SP 5/ NACE No.1-Latest Edition “White Metal Blast Cleaning”

(ii) SSPC-SP 6/NACEN No.3-Latest Edition “Commercial Blast Cleaning”

(j) U.S. Department of Transportation, Federal Highway Administration (FWHA):

(i) FHWA-SA_97-070 “Micropile Design and Construction Guidelines Manual”

(ii) NHI-05-039 “Micropile Design and Construction”

E11.4 Scope of Work

(a) The Micropile Contractor is responsible for furnishing all design, materials, products, accessories, tools, equipment, services, transportation, labour and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.

(b) The Micropile Contractor shall select the micropile type, size, pile top attachment, installation means and methods, estimate the ground-grout bond value and determine the required grout bond length and final micropile diameter. The micropile Contractor shall design and install micropiles that will develop the load capacities indicated on the contract plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.

E11.5 Submittals

(a) Quality Management Plan

(i) Develop and implement a Quality Plan that verifies the micropile installation meets the project specifications. The Quality Plan shall be of sufficient detail to demonstrate the performance requirements of the project have been met. The completed steps of the Quality Plan shall be communicated to the Consultant in a manner and frequency to facilitate the Owner’s Quality Assurance program.

(ii) Identify the personnel responsible for implementation and oversight of the quality control plan for this section in an organization chart. Describe the roles and responsibilities of each person listed.

(iii) Risk Management: List and describe any anticipated project specific risks associated with this section and outline proposed means of mitigation.

(iv) Identify and describe the roles and responsibilities of the personnel responsible for the implementation and oversight of the Quality Plan, including:

Project Manager

Site Superintendent

Micropile Quality Control Coordinator

Drilling Supervisor

Grout Supplier/Supervisor

Micropile Supplier

MIcropile Installer

Micropile Tester

(v) The Quality Plan shall be prepared taking into account the specific requirements of this project and staging of the work. Generic Quality Plans that, in the Consultant's reasonable opinion, fail to address the specific requirements of this project will be returned 'revise and resubmit'.

(vi) Submit Quality Plan/ Quality Control Plan to the Consultant for review a minimum of 2weeks prior to commencement of work onsite.

(vii) Acceptance of the Quality Plan by the Consultant shall be considered a prerequisite for pile installation. Failure of the Contractor to coordinate the timely submission of a complete Quality Plan, which ultimately results in the delay in the start of piling work, shall not be at risk of the Owner or Consultant for back charge.

(b) Contractor Qualifications

(i) Piling Contractor must have demonstrated Micropile design, installation and load testing expertise in projects similar in scope to this project. Provide a list of similar projects that have been completed in the last five years.

(ii) Micropiles are to be designed by a Professional Engineer registered in the Province of Manitoba experienced in the design of Micropiles. Provide a list of similar projects that have been completed in the last five years.

(iii) The Contractor shall assign an Engineer to supervise the work with experience on at least three projects of similar scope to this project completed over the past five years. The on-site foreman and drill rig operators shall also have experience on at least three projects over the past 5 years installing micropiles of equal or greater capacity than required in these plans and specifications.

(iv) At least 10 calendar days before the planned start of micropile construction, the Contractor shall submit the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number and load test reports. The personnel list shall identify the micropile system designer (if applicable), supervising project Engineer, drill rig operators, and onsite foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete enough for the Consultant to determine whether each individual satisfies the required qualifications. The Consultant will approve or reject the Contractor's qualifications within 5 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.

(v) Work shall not be started, nor materials ordered, until the Consultant's written approval of the Contractor's experience qualifications is given. The Consultant may suspend the Work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

(c) Schedule of Work

(i) The contractor shall provide a schedule of planned sequence of installation to Consultant for review, not less than 10 calendar days prior to commencement of pile installation. The schedule shall account for the staging of all works under this tender.

(d) Micropile Design

(i) The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. The final design shall meet the requirements of the CAN CSA S6-25 Canadian Highway Bridge Design Code (CHBDC).

(ii) The required geotechnical resistance factors shall be in accordance with the CHBDC, unless specified otherwise. Estimated soil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, right-of-ways and other applicable design criteria will be as shown on the plans or specified herein.

(iii) Steel pipe used for micropile permanent casing shall incorporate an additional 1.6mm thickness of sacrificial steel for corrosion protection, unless specified otherwise.

(iv) Soil and groundwater conditions are corrosive to buried structural steel. Corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided. Where permanent casing is used for a portion of the micropile, encapsulation shall extent at least 1.5m into the casing.

(v) At least 10 calendar days before the planned start of micropile structure construction, submit complete design calculations and working drawings to the Consultant for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure.

(vi) The micropile drawings and design shall be signed and sealed by a professional engineer registered to practice within the Province of Manitoba.

(vii) Design calculations shall include, but not be limited to, the following items:

-A written summary report which describes the overall micropile design. Applicable code requirements and design references.

-Design calculation sheets (both static and seismic) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page.

-Micropile structure critical design cross-section(s) geometry including soil/rock strata and water levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.

-Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drill-hole diameter assumptions for each soil/rock strata.

-Load and resistance factors used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.

-Design notes including an explanation of any symbols and computer programs used in the design.

-Pile to footing connection calculations.

(e) Micropile Drawings

(i) The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the contract plans:

(ii) A plan view of the micropile structure(s) identifying:

- A reference baseline and elevation datum.
- The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.
- Beginning and end of micropile structure stations.
- Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences.

(iii) An elevation view of the micropile structure(s) identifying micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).

(iv) Design parameters and applicable codes.

(v) General notes for constructing the micropile structure including construction sequencing or other special construction requirements.

(vi) A listing of the summary of quantities on the elevation drawing of each micropile structure showing pay item estimated quantities (if applicable).

(vii) Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used); corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.

(viii) A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths (if applicable).

(ix) Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.

(x) Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Consultant. Provide revised design calculations signed by the approved Registered Professional Engineer for all design changes made during the construction of the micropile structure.

(f) Construction Submittals

(i) Work other than test pile installation shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Consultant. Provide work plan, schedule, welding procedure, headroom requirements and surface water control plan at least 21 calendar days prior to initiating micropile construction.

(ii) Provide mill reports as the work progresses for each delivery.

(iii) Provide grout plan and load test plan at least seven days prior to start of micropile load testing or incorporation of the respective materials into the work.

(iv) Work Plan: Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the micropile drawings in sufficient detail to allow the Contract Administrator to monitor the construction and quality of the micropiles.

(v) Welding procedure: If welding of casing is proposed, submit the proposed welding procedure, certified by a qualified welding specialist.

(vi) Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.

(vii) Surface Water Control Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.

(viii) Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.

(ix) Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:

- Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.
- Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
- Grouting rate calculations, when requested by the Contract Administrator. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.

- Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accord with E11.8(a).
- Procedure and equipment for Contractor monitoring of grout quality.

(x) Load Testing Plan: Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with E11.9, Pile Load Tests.

(xi) Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Consultant has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

E11.6 Materials

(a) Threaded reinforcing steel bar to ASTM A722, Grade 835/1030MPA. Threaded bars to be proof stressed and stress relieved post-tensioning threaded bar. Standard of Acceptance: Products by Dywidag International Inc. All bars to be double corrosion protected.

(b) Structural steel plates and shape for pile top attachments shall conform to CSA G40.21 Grade 350W.

(c) Anchor nut and splice couplers to be compatible with threaded reinforcing steel bar to ASTM A521 and be capable of developing 125% of the ultimate tensile strength of the bar.

(d) Permanent steel casing pipe to ASTM A252, Grade 3, except the yield strength shall be the minimum used in the design submittal.

(e) Grout to CAN/CSA-A3000 with Type 50 sulphate resistant cement for grouting in contact with in situ rock and Type 20 cement for grouting within corrosion protection system encased by PVC. Minimum grout strength to be 40MPa at 28 days.

(f) Grout admixtures to ASTM C494 to manufacturer’s recommendations. Non-chloride.

(g) PVC Casing/Corrosion Protection System to ASTM D1784.

(h) Cement shall be Portland cement conforming to ASTM C 15O.

(i) Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel.

(j) Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5mm and be fully grouted with non-shrink grout.

(k) Epoxy coating shall be in accordance with ASTM A775 or ASTM A934, minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.

(l) Fine Aggregate: If sand - cement grout is used, sand shall conform to ASTM C 144.

(m) Grout: Neat cement or sand/cement mixture with a minimum three (3)-day compressive strength of 14 MPa and a 28 day compressive strength of 28 MPa per ASTM C109.

(n) Provide a minimum 25 mm grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum 12 mm grout cover over the encapsulation of encapsulated bars.

(o) Sheathing: Smooth or corrugated plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D1784, Class 13464-B.

(p) Water used in the grout mix shall be potable, clean, and free from substances that may be injurious to cement and steel.

E11.7 Construction Methods

(a) Equipment

(i) All equipment for the installation, testing and monitoring of the pre-production (verification) and production of Micropiles shall be suitable for the intended purposes and capable of working on the Site under the prevailing access and clearance conditions.

(ii) The equipment used shall be capable of installing and grouting the Micropiles to the prescribed depths or elevations without damage to the pile materials or to the adjacent structures.

(iii) All grout mixers, pumps and hoses shall be of an adequate capacity and shall be sized to enable the Grout to be pumped in one continuous operation, while keeping the Grout in constant agitation prior to pumping, and to allow continuous grouting.

- A high speed, high shear, colloidal Grout mixer with a gauge to measure the quantity of water discharged into the mixer shall be used.
- A paddle mixer is not acceptable.
- The Grout pump(s) shall be equipped with a pressure gauge to monitor Grout pressures of at least 1MPa or twice the actual grouting pressures used, whichever is greater.

(b) Installation

(i) Do not commence pile installation until all required quality control tests have been completed and test results approved by the Contract Administrator.

(ii) Review bedrock type and quality from geotechnical report and make appropriate judgement regarding quantities of grout required for consolidation and achieving grout bond to rock. No claims for compensation based on rock quality and volumes of grout will be considered.

(iii) Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment to avoid eccentricity. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 metres.

(iv) Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 10 mm of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.

(v) Ensure adequate grout pressure is applied to drive grout into rock and ensure that bond can be achieved. Grout to be mixed as per approved mix design, incorporating specified cement types.

(vi) Damage to corrosion protection system will result in rejection. Ensure micropile casings are stored and placed with sufficient care to protect corrosion protection system.

(vii) The Contractor shall control drill flush and construction related waste, including excess grout, during micropile installation and dispose of the same in accordance with Municipal, Provincial and Federal Laws.

(viii) Micropile Allowable Construction Tolerances

- Centerline of installed micropiles no more than 50mm from that indicated on the Contract Drawings.
- Micropile batter out from specified no more then 1H:100V
- Top elevation of pile shall be plus or minus 25mm maximum from vertical elevation indicated.
- Centerline of reinforcing steel shall not be more than 15mm from indicated location.

(ix) During construction, the Contractor shall observe the site conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. The bridge pier adjacent to micropile installation shall be monitored for movement. The contractor shall suspend operations and immediately notify the Contract Administrator if signs of movements are observed.

E11.8 Quality Control

(a) Grout Testing

(i) Grout within the micropile verification and proof test piles shall attain the minimum required three (3)-day compressive strength of 14 MPa prior to load testing.

(ii) Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test piles and initial production piles.

(iii) During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 50- mm grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 cubes tested.

(iv) Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C188/AASHTO T133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be as indicated on working drawings provided by the Contractor.

(v) Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Consultant within 24 hours of testing.

(b) Micropile Installation Records

(i) Contractor shall prepare and submit to the Consultant full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log included at the end of this specification. A separate log shall be provided for each micropile.

E11.9 Pile Load Tests

(a) Perform verification and proof testing of piles at the locations specified herein or designated by the Contract Administrator. Perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein.

(b) The maximum verification and proof test loads applied to the micropile shall not exceed 80% of the structural capacity of the micropile structural elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification test pile elements above the strength required for the production piles shall be provided for in the contractor’s bid price.

(c) The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. When both compression and tension load testing is to be performed on the same pile, the pile shall be tested under compression loads prior to testing under tension loads.

(d) For convenience of testing and set-up, pile testing may be performed in tension, regardless of the governing load, with reference to the maximum governing load, unless specified otherwise.

(e) Testing Equipment and Data Recording

(i) Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The load cell is required only for the creep test portion of the verification test. The contractor shall provide a

description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the Submittals Section.

(ii) Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Align the jack, bearing plates, and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

(iii) Following the “Quick Test” method outlined in ASTM D1143.

(iv) The required load test data shall be recorded by the Engineer.

(f) Verification Load Tests

(i) Perform pre-production verification pile axial compression and lateral load testing to verify the design of the pile system and the construction methods proposed prior to installing any production piles.

(ii) Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required axial load capacities and lateral load capacity. These tests shall validate load test acceptance criteria and verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor’s design and installation methods, and be reviewed and accepted by the Contract Administrator prior to beginning installation of production micropiles.

(iii) Piles used for pre-production testing should not remain in place for usage as production piles unless reviewed and accepted by the Consultant. Test piles to be removed or cut-off and abandoned following completion of testing.

(iv) Verification Test Pile Configuration and Construction

- The drilling-and-grouting method, casing size, and drill size for the verification test pile(s) shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.
- Test verification piles shall be full-scale (same configuration and dimensions as production piles)

(v) Verification Test Quantities and Location

- Two (2) sacrificial verification test piles shall be constructed in conformance with the approved Micropile Drawings.
- Verification test pile(s) shall be installed at the locations proposed by the Contractor and approved by the Consultant. Test piles are to be located such that their installation and performance is representative of production piles, and in locations that will not interfere with production pile installation.

(vi) Verification Test Loading Schedule

- Test verification piles to a maximum test load corresponding to the nominal grout-to- ground bond strength based on the test pile Ultimate Load (UL).
- The verification pile load tests shall be made by incrementally loading the micropile in accordance with the load schedule for the governing load(s):

LOAD	HOLD TIME
AL	1 min
0.10UL	1 min
0.15UL	1 min
0.20UL	1 min
0.25UL	1 min
0.30UL	1 min

LOAD	HOLD TIME
0.35UL	1 min
0.40UL	1 min
0.45UL	1 min
0.50UL	1 min
0.55UL	1 min
0.60UL	1 min
0.65UL	1 min
0.70UL	1 min
0.75UL	1 min
0.80UL	1 min
0.85UL	1 min
0.90UL	1 min
0.95UL	1 min
1.00UL	CREEP TEST (10min to 60min)
0.80UL	1 min
0.60UL	1 min
0.40UL	1 min
0.20UL	1 min
AL	1min

- The alignment load (AL) shall not exceed 5% of the UL. Dial gauges shall be reset to zero after the initial AL is applied.
- The test load shall be applied in increments of 10 percent of the UL. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Unloading shall be applied in decrements of 20% of the UL.
- The verification test pile shall be monitored for creep at the maximum test load (1.00UL): hold the pile load for 10min and record displacement at 0, 1, 2, 3, 4, 6, 10 minutes. If net creep from 1 to 10 minutes exceeds 1.0mm, hold for additional 50min with displacement readings at 20, 30, 50, and 60 minutes

(vii) The acceptance criteria for micropile verification load tests are:

- At the end of the creep test at the maximum test load, test piles shall have a creep rate not exceeding 2.0mm/log cycle time. The creep rate shall be linear or decreasing throughout the creep load hold period.
- Failure does not occur at the maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.
- The Contract Administrator will provide the Contractor written confirmation of the micropile design and construction within three (3) working days of the completion of the verification load tests. This written confirmation will either confirm the capacities and bond lengths specified in the Working Drawings for Micropiles or reject the piles based upon the verification test results.

(viii) Verification Test Pile Rejection

- If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure shall require the Contract Administrators prior review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, test piles shall be removed down to the elevation specified by the Contract Administrator.

(g) Proof Load Tests

(i) Proof Test Quantities and Locations

- Perform Axial and lateral proof load tests on the first two (2) production piles at each pier prior to the installation of the remaining production piles at each pier (total of 4). Location of piles to be tested at the direction of the contract administrator.

(ii) Proof Test Loading Schedule

- Test piles designated for tension proof load testing to a maximum test load of 100% of the factored micropile Design Load (DL) shown on the Plans or Working Drawings.
- Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule:

LOAD	HOLD TIME
AL	1 min
0.20DL	1 min
0.40DL	1 min
0.60DL	1 min
0.80DL	1 min
1.00DL	CREEP TEST (10min to 60min)
AL	1min

- The alignment load (AL) shall not exceed 5% of the DL. Dial gauges shall be reset to zero after the initial AL is applied.
- The test load shall be applied in increments of 20 percent of the DL. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Unloading shall be applied in one decrement to the AL.
- The verification test pile shall be monitored for creep at the maximum test load (1.00DL): hold the pile load for 10min and record displacement at 0, 1, 2, 3, 4, 6, 10 minutes. If net creep from 1 to 10 minutes exceeds 1.0mm, hold for additional 50min with displacement readings at 20, 30, 50, and 60 minutes

(iii) The acceptance criteria for micropile proof load tests are:

- At the end of the 1.00DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time. The creep rate shall be linear or decreasing throughout the creep load hold period.
- Failure does not occur at the 1.00DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

(iv) Proof Test Pile Rejection

- If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile at the same

substructure. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than 50% of the maximum load attained, postgrouting, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure design shall require the Contract Administrators prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification and/or proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

E11.10 Measurement and Payment

(a) The design, supply and installation micro piles will not be measured. This Work shall be paid for at the Contract Lump Sum Price per Parts 1 and 2 for the "Supply and Installation of Micro Piles" which price shall be payment in full for designing the micro piles and 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.

E12. SUPPLY AND PLACING REINFORCING STEEL

E12.1 Description

E12.1.1 This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

E12.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E12.2 References

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

(a) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;

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

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

(d) CAN/CSA G30.18-M92 – Billet Steel Bars for Concrete Reinforcement;

(e) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and,

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

E12.3 Scope of Work

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

E12.4 Submittals

E12.4.1 General

(a) At least twenty-one (21) Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its Operators shall be submitted to the Contract Administrator for review and approval.

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

(c) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on site.

E12.5 Materials

E12.5.1 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.

E12.5.2 Reinforcing Steel

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

(b) Reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18, Grade 400W, Billet-Steel Bars for Concrete Reinforcement except as noted otherwise.

(c) Transverse tie bar reinforcing through the pier steel shall conform to the requirements of CSA Standard CAN/CSA G30.18, Grade 500W, Billet-Steel Bars for Concrete Reinforcement.

(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, millscale, and injurious defects. Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18 and ASTM A955M.

E12.5.3 Bar Accessories

(a) Bar accessories shall be of types suitable for each type of reinforcing and a type acceptable to the Contract Administrator. They shall be made from a non-rusting material, and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic or PVC 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 or as accepted by the contract administrator.

(f) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator in accordance with B7.

(g) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire, 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.

E12.5.4 Mechanical Splices

(a) Tie bars shall be developed using T-bar couplers on their end. End anchorage shall be Dayton Superior D251L or accepted alternate.

E12.6 Equipment

E12.6.1 General

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

E12.7 Construction Methods

E12.7.1 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.

E12.7.2 Reinforcing Steel

(a) 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.

E12.7.3 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) Reinforcing steel shall be placed within the tolerances specified in CAN/CSA A23.1.

(i) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.

(j) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel shall be as specified in E12.5.3, “Bar Accessories”

(k) Welding or tack welding is not permitted.

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

(m) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.

E12.8 Splicing

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

(b) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings.

E12.9 Quality Control and Assurance

E12.9.1 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.

E12.9.2 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.

E12.9.3 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.

E12.10 Measurement and Payment

E12.10.1 Reinforcing steel bars will be measured on a mass basis and paid for at the Contract Unit Price per kilogram for the “Items of Work” listed below, which price shall be payment in full

for supplying all material and for performing all operations herein described and all other items incidental to the Work included in this Specification accepted and measured by the Contract Administrator.

Items of Work:

(a) Supply of Black Reinforcing Steel

(b) Placing Black Reinforcing Steel

E12.10.2 Supplying and installing all the listed materials, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply and Delivery of Reinforcing Steel", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E13. DRILLING AND PLACING DOWELS

E13.1 Description

E13.1.1 This Specification shall cover all operations related to drilling and preparation of dowel holes, coring and preparation of tie bar holes, supply and placing epoxy grout, supply and placing tie bar PVC pipes, supply and place cementitious grout, and installation of the applicable anchorages.

E13.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E13.2 References

E13.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) D14 Environmental Protection Plan;

(b) E10 Masonry Pier Shaft Preparation

(c) E12 Supply and Placing Reinforcing Steel;

(d) E13 Drilling and Placing Dowels;

(e) E14 Structural Concrete;

E13.3 Scope of Work

E13.3.1 The Work under this Specification shall include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(a) Dowels shall include the following:

(i) Drill and clean in limestone masonry blocks on grid as shown on the drawings.

(ii) Supply and install dowels.

(iii) Supply and install other dowels shown on the Drawings

(b) Tie bars shall include the following:

(i) Core holes for rebar ties transversely through the pier

(ii) Supply and place PVC pipe inside of the core hole

(iii) Supply and install tie-bar assembly

(iv) Grout and all grouting operations required to pump grout around tie bar for corrosion protection.

E13.4 Submittals

E13.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E13.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E13.5 Materials

(a) Dowels and tie-bars shall be in accordance with E12 Reinforcing Steel.

(b) PVC pipe for tie bar grouting shall be Schedule 40 pipe or equivalent approved by the Contract Administrator.

(c) Tie-bar end anchor assemblies shall be Dayton Superior D251L Bar Lock End Anchor or equivalent approved by the Contract Administrator.

(d) Epoxy grout shall be Hilti HIT-RE 500-V3 or equivalent as approved by the Contract Administrator. The epoxy grout shall be suitable for horizontal, vertical or overhead dowel grouting application as required.

(e) Cementitous grout to CAN/CSA A3000 Type GU / 20. Minimum grout strength of 40MPa at 28days.

E13.6 Equipment

E13.6.1 General

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

E13.7 Construction Methods

E13.7.1 Drilling and Placing Dowels

(b) Dowel hole diameters shall be in accordance with the recommendations of the epoxy adhesive grout manufacturer.

(c) All holes shall be thoroughly cleaned prior to the installation of grout and dowels.

(d) The epoxy adhesive grout shall be prepared, placed and cured in accordance with the recommendations of the epoxy adhesive grout manufacturer.

(e) Dowel bars shall be set as shown on the Drawings.

E13.7.2 Coring and Placing Tie Bars

(a) Core holes there the width of the existing pier at the locations shown on the drawings. Core holes shall be placed within a 1% tolerance both vertically and horizontally unless otherwise approved by the Contract Administrator.

(b) The core holes shall be of sufficient size to install the PVC grouting pipe.

(c) Install the PVC grouting pipe through the width of the existing pier.

(d) Place the tie-bar and support it with space such that the bar will be surrounded by grout.

(e) Place grout. The cementitious grout shall be prepared, placed, and cured in accordance with the recommendations of the manufacturer and provide full encapsulation of the tie bars through the width of existing pier.

(f) Install end anchors.

E13.8 Quality Control and Assurance

E13.8.1 Quality Control

(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.

E13.8.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

(b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

(c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E13.9 Measurement and Payment

E13.9.1 Drilling and Placing Dowels

(a) The supply of reinforcing steel for the dowels will be measured and paid for in accordance with Specification E12.

(b) Drilling and placing dowels will be paid for at the Contract Unit Price per dowel for the "Items of Work" listed below, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

Items of Work:

(a) Drilling and Placing Dowels
  (i) 15M Dowels
  (ii) 20M Dowels

E13.9.2 Coring and Placing Tie Bars

(a) The supply of reinforcing steel for the dowels will be measured and paid for in accordance with Specification E12..

(b) Coring and placing tie bars will be paid for at the Contract Unit Price per tie bar for the "Items of Work" listed below, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

Items of Work:

(a) Coring and Placing Tie Bars
  (i) 35 M Tie Bars
  (ii) 45 M Tie Bars

E14. STRUCTURAL CONCRETE

E14.1 Description

E14.1.1 This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the Drawings.

E14.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E14.2 References

E14.2.1 The latest edition and subsequent revisions of the following:

(a) American Concrete Publication SP4 – Formwork for Concrete;

(b) ASTM A1035 – Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement;

(c) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes;

(d) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

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

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

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

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

(i) ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete;

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

(k) ASTM C1876 – Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete;

(l) CSA A23.1 – Concrete Materials and Methods of Concrete Construction;

(m) CSA-A3001 – Cementitious Materials for Use in Concrete; and

(n) CSA O121 – Douglas Fir Plywood.

E14.3 Scope of Work

E14.3.1 The Work under this Specification shall include:

(a) Supplying and placing structural concrete for pier works; and

(b) Architectural form liner on faces of pier shaft as shown on the drawings to provide block pattern.

E14.4 Submittals

E14.4.1 General

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

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

E14.4.2 Concrete Mix Design Requirements

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

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

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

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

(iii) Aggregate source location(s);

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

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

(vi) The limits for slump;

(vii) The limits for air content;

(viii) Quantity of other admixtures;

(ix) Certification that all concrete constituents are compatible; and

(x) Certification that the concrete mix(es) will meet the specified concrete performance requirements.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of fourteen (14) days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each 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 Clause 4.3.2.3.2.

(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.

E14.4.3 Concrete Mix Design Test Data

(a) Concrete

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

(ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria.

(iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into the form. At the discretion of the Contract Administrator, if the Contractor can demonstrate a relationship between the plastic concrete properties at the point of discharge into the formwork and the end of the chute of the delivery truck, the Contract Administrator may accept test results at the end of the chute with the appropriate adjustments to the wet concrete performance requirements as being representative of what is in the formwork.

(b) Aggregates

(i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.

(iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

(iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

(v) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

(vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.

(vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

(c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E14.4.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix

design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

E14.4.5 Temporary False Work, Formwork and Shoring Works

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and shop drawings for any temporary Works, including 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, “False Work for Construction Purposes.” The shop drawings shall bear the Professional Engineer's seal. Shop drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such shop drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(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 S269.1-16. 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 Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (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 Section 103 of the above reference shall apply.

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

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

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

(d) 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.

(e) 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.

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

(g) 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.

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

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

(j) 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.

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

(l) Forms shall be designed for the architectural form liner in locations shown on the drawings.

E14.4.6 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, architectural form liner attachment, 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.

E14.4.7 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.

E14.5 Materials

E14.5.1 General

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

E14.5.2 Testing and Approval

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

(b) All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.

E14.5.3 Adhesive Agent

(a) Adhesive agent for bonding steel reinforcing or dowels to concrete shall conform to the requirements of ASTM C881, Type V, Grade 3, Class A, B and C, except linear shrinkage. An acceptable product would be Hilti Hit-RE 500 V3, or equivalent.

E14.5.4 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.

E14.5.5 Concrete

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

(b) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table E14.1.

TABLE 14.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements
Type 1	Piers	35 @ 28 Days	C-1	1	20 mm	NA

E14.5.6 Working Base Concrete

(a) The Contractor may choose to install working base concrete below the base slab as a leveling course and for reinforcing steel support incidental to the works of the specification.

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

(i) 20 MPa at 28 days.

E14.5.7 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

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

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

(b) Fine Aggregate

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

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

(c) Coarse Aggregate – Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse

aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

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

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

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

E14.5.8 Admixtures

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

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

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

E14.5.9 Cementitious Materials

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

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

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

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

E14.5.10 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.

E14.5.11 Formwork

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

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121- M1978, a minimum of 20 mm thick.

(c) Where shown on drawings architectural form liner shall be accommodated by the formwork.

(d) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved Manufacturers are “Evans” and “C-Z.”

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

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

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

(h) 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.

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

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

E14.5.12 Form Coating

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

(b) Form coating on the segments of formwork with architectural form liner shall be Sika Form Release 7000, or equal as accepted by the Contract Administrator, in accordance with B7.

E14.5.13 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B6. This formwork liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.

(b) Architectural form liner shall be Sika Greenstreak concrete form liner pattern No. 329 12” x 24” Running Bond Ashlar with 1.0 in relief or equal as accepted by the Contract Administrator, in accordance with B6.

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

E14.5.14 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.

(b) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B7.

E14.5.15 Curing Blankets

(a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour.

(b) An approved product is “Mirafi Geotextile P150”. Alternately, a 10 oz burlap, 5 mil polyethylene, curing blanket white in colour shall be used; “Curelap” manufactured by Midwest Canvas, together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B7.

E14.5.16 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

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

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

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

E14.5.17 Epoxy Adhesive

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

E14.5.18 Epoxy Grout

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

E14.5.19 Cementitious Grout

(a) Cementitous grout shall be nonshrink and nonmetalic. Approved products are Sternson M- bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non- Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E14.5.20 Patching Mortar

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

E14.5.21 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B7.

E14.6 Equipment

E14.6.1 General

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

E14.6.2 Vibrators

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

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

E14.7 Construction Methods

E14.7.1 General

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

(b) Rate of application shall be the rate required to meet the requirements of ASTM C309-98a for the texture of concrete the curing compound is being applied to.

E14.7.2 Temporary False Work, Formwork, and Shoring

(a) Construction Requirements

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

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

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

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

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

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

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

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

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

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

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

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

(xiii) Forms shall accommodate the requirements of the architectural form liner.

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

(c) 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.

(d) 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.

(e) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break- back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in matching colour of surrounding concrete.

(f) 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.

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

(h) Where required by the Contract Administrator, the Contractor shall cast test panels demonstrating the finish of the architectural form liner. The test panel may be striped after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.

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

E14.7.3 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 E14.7.6, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E14.7.4 Permeable Formwork Liner

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

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

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

E14.7.5 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 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.

(ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 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 E14.1, “Requirements for Hardened Concrete”, no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1, 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers’ designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

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

(d) Delivery of Concrete

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

(e) Concrete Placement Schedule

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

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

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

E14.7.6 Preparation for Concreting Against Hardened Concrete

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

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

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

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

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

E14.7.7 Placing Structural Concrete

(a) General

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

(b) Placing Structural Concrete

(i) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.

(ii) 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.

(iii) 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.

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

(v) 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.

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

(vii) 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.

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

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

(x) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the

reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.

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

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

E14.7.8 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

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

(b) Type 1 Finish – Exposed Formwork Surfaces

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

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

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

(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 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of this Specification.

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

(iii) 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.

E14.7.9 General Curing Requirements

(a) Refer to E14.7.12 for cold weather curing requirements and E14.7.13 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 ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

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

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

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

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

(i) For curing of barriers, formwork shall remain in place for seven (7) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe. Following removal of the barrier formwork curing compound shall be applied to all exposed faces.

E14.7.10 Form Removal

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

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

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

E14.7.11 Patching of Formed Surfaces

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

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

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

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

(e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one (1) hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

(g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E14.7.12 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 5°C during placing or curing.

(b) Heating and hoarding shall be started following cutoff of sheet pile, to allow for stud welding at the pier, prior to reinforcement placement.

(c) Prior to concrete placement the temperature of the existing substrate concrete or masonry substrate shall be a minimum of 10°C

(d) Prior to concrete pier shaft placement excluding the base slab, the core of the existing rubble filled masonry block pier shall be heated to minimum of 5°C unless otherwise approved by the Contract Administrator.

E14.7.13 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

(ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.

(iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.

(iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.

(v) Sun shades and wind breaks shall be used as required during placing and finishing.

(vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

(vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.

(viii) Hot weather curing shall follow immediately after the finishing operation.

(b) Hot-Weather Curing

(i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.

(ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

(i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

(d) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E20.2, “Acceptable Concrete Temperature”, for the indicated size of the concrete section.

TABLE E14.2: ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION	TEMPERATURE °C	
	MINIMUM	MAXIMUM
Less than:		
1.0 m	10	27
1.2 m	5	25

(e) Clean-up

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

E14.8 Quality Control and Assurance

E14.8.1 Quality Control

(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.

(d) 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.

(e) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(f) 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.

(g) Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(h) 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.

(i) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1. An outline of the quality tests is indicated below.

(j) Contract Administrator shall undertake a cover meter survey of top of bridge deck and inside face of barriers. Concrete areas no within specified tolerances will be rejected.

E14.8.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

(b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

(c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

(d) Concrete Quality

(i) Inspection

- 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.
- Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

(ii) Access

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

(iii) Materials

- 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.
- All materials shall conform to CSA Standard A23.1.
- All testing of materials shall conform to CSA Standard A23.2.
- 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 own expense.

(e) Concrete Testing

(i) 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 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.

(ii) 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 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.

(iii) 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 230 microns with no single test greater than 260 microns.

(iv) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202 and shall meet the requirements of each class of concrete.

(v) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C, "Sampling Plastic Concrete".

(vi) 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".

(vii) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the

concrete strength, a strength test being the strength of a single standard cured specimen.

(viii) 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 E14.1 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.

(f) Corrective Action

(i) 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.

E14.9 Measurement and Payment

E14.9.1 Supplying and placing structural concrete will not be measured. This Work shall be paid for at the Contract Lump Sum Price per Parts 1 and 2 for “Supplying and Placing Structural Concrete”, 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.

Items of Work:

(a) Supply and Place Structural Concrete

(i) Base Slab

(ii) Pier Shaft

E14.9.2 Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Supply and Place Structural Concrete”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E14.9.3 Heating concrete and housing and heating deposited concrete will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E15. RIP RAP

E15.1 Description

E15.1.1 These Specifications govern all operations necessary for and pertaining to the supplying and placing of approved riprap as a protective covering as indicated on the Drawings or designated by the Contract Administrator in the field.

E15.1.2 This Specification shall amend and supplement Specification No. CW 3615.

E15.1.3 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E15.2 References

(a) All reference standards and related specifications shall be current issue or latest revision at the date of tender advertisement.

(b) Specifications

(i) CW 3615-R4 – for Riprap

E15.3 Submittals

E15.3.1 The Contractor shall submit the proposed supplier(s) and location of quarry sites at least ten (10) business days prior to the supply of riprap to the Site, to confirm that sufficient quantity of specified rock is available.

E15.3.2 The Contractor shall supply representative test results at least ten (10) business days prior to the supply of riprap to the Site, demonstrating that the material to be supplied is of adequate quality and gradation to satisfy the material specifications contained herein.

E15.4 Materials

E15.4.1 Rock

(a) Rock for riprap shall consist of hard, dense, durable rock. The rock shall be quarried rock or fieldstone, dense and durable, and resistant to the action of frost and water and suitable in all other respect for the purpose intended. Stone rip-rap shall be free of sod, roots, organic material and debris prior to placement. Individual pieces of stone shall be free of defects such as seams or cracks prior to placement. Where stipulated, rock is to be of the same type as that existing in place meeting the following properties:

(i) minimum bulk specific gravity of 2.6 (ASTM C127);

(ii) maximum Los Angeles abrasion loss of thirty–two percent (32%) (ASTM C535);

(iii) maximum Magnesium Sulphate Soundness Loss of thirteen percent (13%) (ASTM C88);

(iv) maximum absorption of two and a half percent (2.5%) (ASTM C127);

(v) gradation requirements, as follows:

The riprap shall be well graded having a full range and even distribution of sizes and shall conform to the following gradation:

Table E15-1: Gradation Requirements for Rip-rap

Diameter (mm)	Percent Passing by dry Weight	
	Class 350	Class 450
450		100%
350	100%	
300		40% - 70%
200	15% - 50%	
100		25% - 50%
5	0% - 15%	0% - 5%

(b) Individual particles shall be shaped such that no dimension is greater than four (4) times the smallest dimension. Flat, elongated, or platy particle shapes will not be accepted.

(c) The diameter shall be taken as the average of the shortest and longest dimension measured on an individual piece of riprap.

(d) Contractors supplying riprap shall be responsible for demonstrating that the material is of adequate quality, gradation, and volume to meet the material specifications contained herein.

(e) All materials set forth in this Specification shall be subject to inspection and testing by the Contract Administrator or by the testing laboratory designated by the Contract Administrator.

(f) The Contract Administrator will visit proposed quarry Sites for inspection of the proposed riprap material and quarry faces a minimum of fourteen (14) days prior to supply and placement of riprap.

(g) No supply and placement of riprap will be permitted prior to the Contract Administrator approving the source.

(h) The testing frequency necessary to confirm the material quality will be specified at the discretion of the Contract Administrator.

E15.5 Equipment

E15.5.1 General

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

E15.6 Construction Methods

(a) Place the rock riprap at the locations, extents and minimum thickness as shown on the Drawings.

(b) Dump the rock in such a manner that the larger stones are uniformly distributed, and smaller rocks serve to fill the spaces between the larger rocks. Sufficient machine work shall be done to procure a neat and uniform surface with the thickness as shown on the Drawings.

(c) Care shall be taken to minimize underwater turbulence and sediment.

E15.7 Measurement and Payment

E15.7.1 Supplying and Placing Riprap

(a) Supplying and placing riprap will not be measured. This Work shall be paid for at the Contract Lump Sum Price per Parts 1 and 2 for “Supplying and Placing Riprap”, 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.

E16. TEMPORARY SUPERSTRUCTURE JACKING

E16.1 Description

E16.1.1 This Specification shall cover all operations related to bridge superstructure jacking and supporting as specified herein and indicated on the Drawings.

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

E16.2 References

E16.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) D14, Environmental Protection Plan

(b) E6, Traffic Control

(c) E7, Traffic Management

(d) E17, Removal and Installation of Bearings

(e) E18, Miscellaneous Metal

E16.3 Scope of Work

E16.3.1 The Work under this Specification shall involve:

(a) Temporary shoring and jacking shall be provided as required to undertake the abutment modifications, bearing replacement, and associated works at the abutments and in accordance with the details shown on the Drawings.

(b) Modifications to existing bridge components required to facilitate bridge jacking.

(c) Raising the superstructure at SU1 and SU5 is intended to permit the Contractor to carry out the following works:

(i) Removal of existing bearings;

(ii) Blasting and cleaning existing steel surfaces in contact with new bearings ;

(iii) Installation of new bearings; and

(iv) Miscellaneous modifications to the abutments.

(d) Jacking points and allowable loads are provided on the Drawings. The Contractor will be responsible for the final choice and design of the shoring and jacking system that is acceptable to the Contract Administrator.

E16.4 Submittals

(a) The Contractor shall submit to the Contract Administrator, at least fourteen (14) calendar days prior to commencement of any jacking and supporting operation, detailed drawings of the Contractor's proposed jacking and supporting system, equipment and procedures. The detailed plans shall be designed by, prepared by, and bear the seal of a Professional Engineer (Design Engineer), registered to practice in the Province of Manitoba. The detailed drawings shall include, but not be limited to:

(i) type, number and location of jacks and all other equipment and structures to be used for jacking;

(ii) details of standby jacking, and supporting equipment (including provisions for allowing normal expansion / contraction movements of the bridge superstructure and the potential for movements resultant from release of potential locked in stresses);

(iii) Written confirmation that the final jacking system is adequate for the jacking loads stated on the Drawings;

(iv) superstructure support details; and

(v) procedures and sequence of work for jacking up and supporting the bridge superstructure and transferring of load onto the bearing assemblies.

E16.5 The submission of the detailed drawings will in no way relieve the Contractor of the full responsibility for the design and proper operation of the jacking and supporting system. The Contractor's Design Engineer shall be responsible for visiting the site as often as is necessary to inspect the jacking and supporting equipment and procedures so as to ensure that the work is carried out in accordance with the Design Engineer's sealed detailed drawings. The Contractor shall provide the Contract Administrator with a letter bearing the seal of the Design Engineer, certifying after personal inspection of the work that the jacking and supporting is being carried out in accordance with the sealed detailed drawings.

E16.6 Materials

E16.6.1 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) 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.

E16.7 Equipment

E16.7.1 General

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

E16.7.2 Jacking System

(a) The jacking system shall be capable of jacking the superstructure simultaneously, uniformly and equally at the abutments and piers. The jacking system shall also be capable of releasing load, lowering the bridge superstructure and transferring load to the bearings simultaneously, uniformly and equally.

(b) The Contractor shall have adequate standby jacking and supporting equipment at the site prior to starting any jacking in order to ensure that bridge superstructure jacking and supporting is continuous, timely and achieved without interruption.

E16.8 Construction Methods

E16.8.1 Sequence of Work

(a) Jacking shall only occur after the bridge has been closed to vehicular traffic.

(b) The jacking sequence at SU1 and SU5 listed on the drawings should be adhered to.

(c) After jacking the superstructure at SU1 and SU5, perform all operations as per the Drawings.

E16.8.2 Jacking and temporary supporting operations shall be undertaken in such a manner to prevent distortion and provide equal lift of the superstructure. The Contractor shall jack up and lower the superstructure simultaneously, uniformly and equally. Change in soffit elevation at any point along the jacking line shall not vary by more than +/- 2 mm from the average.

E16.8.3 Monitoring jack extension alone is not sufficient for maintaining elevation control – deflection of jack supports must also be accounted for.

E16.8.4 Jacks and supporting structures shall have a minimum safe working load at least one hundred and fifty percent (150%) of the expected jacking forces.

E16.8.5 The Contractor shall jack the bridge the minimum vertical dimension required to carry out the required repair, rehabilitation, and modification works.

E16.8.6 The Contractor shall locate the jacking and supporting equipment such that it does not interfere with the required construction operations. After jacking, blocking can be erected for temporary support. Blocking shall be erected immediately adjacent to each side of each jacking bearing plate. The total bearing area of blocking per jacking point shall be, at minimum, equal to the area of the jacking bearing plate.

E16.8.7 Prior to jacking the Contractor shall establish and have in place a method of defining and measuring the elevation of the underside of the superstructure relative to a fixed point on the substructure unit immediately below. Monitoring points shall be provided under each girder.

E16.8.8 The Contractor shall be responsible for taking these measurements in the presence of the Contract Administrator. The following measurements shall be done to monitor the rate and amount of jacking and to establish the vertical location of the bridge superstructure at completion of all works.

(a) Prior to jacking;

(b) At completion of jacking;

(c) After jack release, lowering the bridge superstructure and transferring of load onto bearing assemblies.

E16.8.9 The Contractor’s temporary supports shall be designed for and must be capable of allowing the normal expansion / contraction movements of the bridge superstructure to take place while they are being used.

E16.8.10 The shoring and jacking design shall include provision of lateral restraint to the superstructure.

E16.9 Quality Control and Assurance

E16.9.1 Quality Control

(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.

E16.9.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

(b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

(c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E16.10 Measurement and Payment

(a) Jacking and supporting of the bridge superstructure will not be measured. Jacking and supporting of the bridge superstructure will be paid for at the Contract Lump Sum Price per Parts 1 and 2 for “Temporary Superstructure Jacking and Support System”, 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.

E17. REMOVAL AND INSTALLATION OF BEARINGS

E17.1 Description

E17.1.1 This Specification shall cover all operations relating to removal of existing bearings and installation of new steel pot bridge bearings supplied by others including attachment to the bridge as shown on the Drawings.

E17.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E17.2 References

E17.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) E18. Miscellaneous Metal.

(b) CAN/CSA S6-25 Canadian Highway Bridge Design Code

(c) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels

(d) CAN/CSA G164 – Hot Dip Galvanizing of Irregularly Shaped Articles

(e) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding)

(f) ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(g) ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

(h) ASTM A193/A193M – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

(i) ASTM F1554 - Grade 36 for Anchor Bolts, Nuts, and Washers

(j) ASTM F3125 – Grade A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

(k) ASTM F3125M– Grade A325M Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).

(l) ASTM D4894 – Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials.

(m) SSPC-SP6 “Commercial Blast Cleaning”.

E17.3 Scope of Work

E17.3.1 The Work under this Specification shall include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(a) Removal of existing bearings

(b) Supply of pedestal anchor bolts at SU1

(c) Installation of new steel pot bearings supplied by other including but not limited to:

(i) Sole plates, top plates, and masonry plates;

(ii) Preformed fabric pad; and

(iii) All fasteners, bolts, and anchor bolts.

E17.4 Submittals

E17.4.1 The Contractor shall submit the following to the Contract Administrator, in accordance with the Specification:

(a) The Contractor shall submit to the Contract Administrator the removal and installation procedures and methods, for the existing and new bearings respectively. he intends to use for approval at least ten (10) days prior to starting any bearing removal or installation. The installation procedure will be subject to review by the Contract Administrator and the bearing supplier.

(b) The Contractor shall submit to the Contract Administrator any proposed repair procedures for damaged coating areas for approval seven (7) days prior to proceeding with the repair.

E17.5 Materials

E17.5.1 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) 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.

E17.5.2 New Pot Bearings

(a) New pot bearings for the south abutment SU1 and Pier SU5 will be supplied by others to the City Bridge Yard at 960 Thomas Avenue or alternate location within the City Limits. The Contactor will be responsible for transportation and safe storage of the pot bearings to the bridge site. Arrangement can be confirmed through the Contract Administrator.

(b) Released for fabrication shop drawing completed by others for the bearing assemblies will be provided to the Contractor as soon as available for planning of work.

E17.5.3 Anchor Bolts

(a) Anchor bolts shall conform to ASTM F1554 Grade 36. Anchor bolts, nuts, and washers shall be hot-gipped galvanized in accordance with CAN/CSA G164 and ASTM 123 to a minimum 87 um thickness unless otherwise noted on the drawings.

(b) Bearing fixing bolts shall be ASTM F3125 Grade A325/325M. Galvanized bolts shall be used when fixing galvanized or metallized plates.

E17.5.4 Epoxy Adhesive

(a) Anchor bolts shall be placed with epoxy adhesive approved by the Contract Administrator.

(b) Masonry plate shall be bonded to existing cast iron pedestal utilizing Sikadur 53 or approved equivalent in accordance with B7 “Substitutes”.

E17.5.5 High Strength Bolts, Nuts and Washers

(a) ASTM F3125/F3125M Grade A325/A325M high strength bolts shall be used for bolted connections. Bolts shall be sufficiently long to exclude threads from the shear plane.

E17.5.6 Welding Consumables

(a) The requirements of the Specification for Supply and Delivery of Structural Steel, Clause E20.4.5 shall apply.

E17.5.7 Cold Applied Galvanizing Compound

(a) Approved cold-applied galvanizing compound is as follows:

(i) ZINGA, as manufactured by ZINGAMETALL, Ghent, Belgium, available from Pacific Evergreen Industries Ltd. Vancouver, BC, Ph. (604) 926-5564, and Centennial Mine & Industrial Supply, Saskatoon, Sask., Ph. (306) 975-1944.

E17.6 Equipment

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

E17.7 Construction Methods

E17.7.1 General

(a) Any structural steel components that in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

(b) Bearings shall be stored in a secure, clean facility.

E17.7.2 Removal of Existing Bearings

(a) Upon jacking and shoring of the superstructure as per E16 Temporary Superstructure Jacking, the Contractor shall remove and dispose of the existing bridge bearings at SU1 and SU5 as indicated on the drawings.

(b) The Contractor shall only use methods of steel removal that will not damage the existing structure to remain or new structures as approved by the Contract Administrator.

E17.7.3 Installation

(a) Bearings

(i) Before erection of the bearings, the Contractor shall satisfy themself that the location of substructure units and elevations of bridge seats 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.

(ii) The Contractor shall accurately assemble and install the bearings as specified on the Drawings and as directed by the Contract Administrator.

(iii) Temporary clamping devices shall be used to maintain the correct orientation of the parts during handling, transport, storage, and installation but are not to be used for slinging or suspending bearings unless specifically designed for this purpose.

(iv) Bearings shall be protected during handling, transport, storage, and installation.

- The pot bearing assemblies shall be protected from damage, distortion, and excessive heat and shall be kept clean and free of all deleterious matter, contaminants, dirt, dust, and moisture during handling and installation.
- Pot bearing assemblies that have been preassembled shall not be dismantled unless absolutely necessary for inspection or installation. Bearings shall not be opened or dismantled at the site except under the direct supervision of or with the approval of the Manufacturer.

(v) The Contractor shall verify the coding and condition of the bearings supplied to site.

- Any damage and/or miscoding shall be promptly reported to the Contract Administrator.
- The Contractor shall install the pot bearings assemblies at the locations and in accordance with the details as shown on the Plans, the Shop Drawings, and the installation procedures.

(vi) All existing steel surfaces in contact with the new bearing assemblies shall be clean, sound metal, free of dirt, debris, rust, and all foreign matter.

(vii) The Contractor shall ensure that the bearings are installed by qualified personnel.

- A representative from the bearing Manufacturer will Review the bearing installation.

(viii) Bearings shall be set at time of installation to the dimensions and offsets as shown on the Plans and final approved Shop Drawings and shall be adjusted as necessary to take into account the temperature and future movements of the bridge due to temperature. Clamping devices shall be removed after each bearing is in its final position with all permanent connections made and after all concrete and grout in contact with the bearing has been placed. Provision shall be made to keep the pot bearing assemblies in correct position during the placement. Steel shims are included within the bearing assembly to allow for elevation adjustment.

(ix) Upon completion of the work, the top and bottom surfaces of the bearings shall be in full contact with the structure. Bearing assemblies shall be uniformly bedded over their entire area. Voids or hard spots after installation will not be acceptable.

(x) Field welding shall conform to the requirements of CSA W59.1.

- Prior to field welding, all coatings on the steel areas being welded shall be removed in the area of weld.

- All field welds and areas of damaged coating shall be repaired with an approved zinc metalizing touch up material followed by application of the primer and aluminium-coloured polyethylene sealer original used to coat the pot bearing assemblies. The proposed zinc metalizing touch up material as well as the proposed procedure for repair of damaged coating areas shall be submitted by the Contractor to the Contract Administrator for review and comment.

(xi) Tighten threaded fixings uniformly to avoid overstressing any part of the bearing. Supply vibration-resistant-type fasteners where significant vibration may occur.

(xii) After installation, leave bearings and their surrounding areas clean.

(xiii) The Contractor shall ensure that the bearing assemblies are installed in such a manner that will not void the fabrication guarantee provided by the Manufacturer.

(xiv) Any bearings that in the opinion of the Contract Administrator have been damaged or otherwise rendered unusable by improper storage or handling by the Contractor shall be replaced by the Contractor at his expense.

(b) Bolted attachment

(i) The Contractor shall note that the bolted attachments are essential to the structural adequacy of the bearings and care shall be taken not to damage them during construction.

(ii) The Contractor will be required to drill bolt holes through the bearing seat plate to align with existing rivets holes on the structure floor beam.

(iii) A325 Bolts shall replace the rivets as the attachment method and shall be properly aligned between the existing rivet holes and seat plate of the new bearing assembly. All methods and materials for setting the bolts shall be submitted to the Contract Administrator for review and acceptance.

(iv) Assembly

- The assembly of joints shall be according to CAN/CSA S16 except that Turn-of- Nut tightening method shall be the only installation method used.
- Prior to assembly, all joint surfaces, including those adjacent to bolt heads, nuts and washers, shall be free of loose scale, burrs, dirt, and foreign material.
- The faying surfaces of connections identified as slip-critical connections shall be prepared as specified below.
- For clean mill scale, the surfaces shall be free of oil, paint, lacquer, or any other coating and then blast cleaned.
- For coated surfaces other than galvanized, the surfaces shall be free of oil, lacquer, or other deleterious coatings.
- Hot dip galvanized surfaces shall be roughened after galvanizing by means of hand wire brushing. Power wire brushing is not permitted.
- This treatment shall apply to all areas within the bolt pattern and for a distance beyond the edge of the bolt hole that is the greater of 25 mm or the bolt diameter.

(v) Bolt Tension

- Pretensioned bolts shall be tightened to at least 70% of the specified minimum tensile strength given in the appropriate ASTM standard.

(vi) Reuse of Bolts

- Bolts shall not be reused once they have been fully tightened. Bolts that have not been fully tensioned may be reused up to two times, providing that proper control on the number of reuses can be established. Retightening of bolts loosened due to the tightening of adjacent bolts is not considered to be a reuse.

(vii) Hardened Washers

- Hardened washers shall be provided under the head and the nut of each bolt for a total of two (2) washers per bolt.
- Hardened washers are required under the nut and bolt head adjacent to joint surfaces containing oversize or slotted holes.

(viii) Bevelled Washers

- Bevelled washers shall be used to compensate for lack of parallelism where an outer face of bolted parts deviates by more than 5% from a plane normal to the bolt axis.

(ix) Turn-of-Nut Tightening

- After aligning the holes in a joint with a properly sized drift pin, sufficient bolts shall be placed and brought to a snug-tight condition to ensure that the parts of the joint are brought into full contact with each other.
- Following the initial snugging operation, bolts shall be placed in any remaining open holes and brought to snug-tightness. Resnugging may be necessary in large joints.
- When all bolts are snug-tight, each bolt in the joint shall be tightened additionally by the applicable amount of relative rotation given in Table E20.4, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench. The bolt and nut shall be matched marked to enable the amount of relative rotation to be determined.

TABLE E17.1

Nut Rotation From Snug-Tight Condition

Outer Face Alignment of Bolted Parts	**Bolt Length L_b**	**Turn From Snug**
Both faces normal to bolt axis or one face normal other face sloped 1:20 max – bevelled washers not used	$L_b \leq 4\ d_b$	1/3
	$4\ L_b < L_b \leq 8\ d_b$ Not exceeding 200 mm	1/2
	$8\ d_b < L_b \leq 12\ d_b$ or exceeding 200 mm but less than12 db	2/3
Both faces sloped 1:20 from normal axis – bevelled washers not used.	All Bolt Lengths up to 12 d_b	3/4

NOTES:

1. Bolt diameter is indicated as d_b.
2. When bolt length exceeds 12 diameters, the required nut rotation shall be determined by actual testing in a suitable tension calibrator that simulates the condition of the solidly fitting steel.
3. Tolerance on rotation is 30 degrees over/under.
4. Table applies to coarse-thread. Heavy-hex structural bolts of all sizes and lengths used with heavy-hex semi finished nuts.
5. Bolt length is measured from the underside of the head to the extreme end point.
6. Bevelled washers shall be provided when A490 or A490M bolts are used.

(x) Field Fit-up

- Connection holes into existing structural steel materials shall only be drilled in the field with the new structural steel firmly clamped in place.
- Components shall be supported in a manner consistent with the final geometry of the bridge as specified in the Drawings.
- Holes in the webs and flanges of main components shall be drilled to finished diameter while in assembly.

(xi) Match Marking

- Connecting parts that are assembled in the shop for the purpose of reaming or drilling holes shall be match-marked. A drawing shall be prepared for field use detailing how the marked pieces shall be assembled in the field to replicate the shop assembly.

(c) Alignment and Tolerances

(i) The pot bearing assemblies shall be installed so that their longitudinal and transverse centrelines are within +/-3 mm of the position shown on the Plans. Threaded fixings shall be tightened uniformly to avoid overstressing any part of the bearing. Bearings and their surrounding areas shall be left clean after installation.

(ii) The centreline of the bearings along the direction of movement shall be parallel to the direction of the movement of the bridge.

(iii) Bearing assemblies shall be set to their correct inclination to the horizontal to the tolerance of 0.1°.

(iv) Concrete surfaces in contact with the bearings shall not vary from a flat plane by more than 3mm in 500mm within the plan area of the bearing and local irregularities shall not exceed 1mm.

(v) The tolerance for the elevations at the top of the bearing assemblies shall be -0 mm / +2 mm.

(d) Adjustment of Bearings

(i) Adjustment to bearing location and bearing elevation shall be undertaken so as to achieve the lines and grades shown on the Drawings. The Contractor shall ensure that the structural steel is maintained in correct position and alignment until adjoining elements have been erected and completed.

(ii) Bearings shall be set in accordance with the table details shown on the Plans. When compensations for temperature are required, they shall be based on a coefficient of steel of 12 x 10-6 per degree Celsius.

(iii) Bearings and girders shall not be considered as being fixed finally in position until approval of the installation is given by the Contract Administrator, at the completion of the erection of materials.

E17.7.4 Coatings damaged by bearing replacement and temorary jacking operations as well as unfilled bolt holes shall be touched up with cold applied galvanizing compound as specified herein.

E17.8 Quality Control and Assurance

E17.8.1 Quality Control

(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.

(d) Quality control testing for the bearings shall be completed in accordance with the latest edition of CAN/CSA S6-25 Canadian Highway Bridge Design Code

(e) The Contractor shall be made aware that minor adjustments of the bearing locations may be required as directed by the Contract Administrator during installation to ensure the centerlines of the bearing stiffener, centerline of sole plate, and temperature corrections are satisfied as per the Plans. Any deviations from the Plans shall be submitted to the Contract Administrator for approval prior to proceeding.

E17.8.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

(b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, Standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

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. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E17.8.3 Guarantees

(a) Installation Guarantee

(i) The Contractor shall ensure that the bearings are installed in such a manner that will not void the fabrication guarantee.

(ii) The Contractor shall guarantee in writing, the performance of the bearings for a period of five (5) years from the date of issuance of Substantial Performance. Provided in the guarantee for the replacement of the bearings at no cost to the City of Winnipeg in the event that the bearings do not perform satisfactorily in the range of design movement and under the design loads.

E17.9 Measurement and Payment

E17.9.1 Removal and Installation of Bearings will be measured on a unit basis and paid for at the Contract Unit Price per unit 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, accepted and measured by the Contract Administrator.

Items of Work:

Bearings

(i) Removal of Existing Bearings

(ii) Installation of New Bearings

E18. MISCELLANEOUS METAL

E18.1 Description

E18.1.1 This Specification covers all operations relating to the supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification.

E18.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E18.2 References

(a) References and Related Specifications:

(i) All related Specifications shall be current issued or latest revision at the first date of tender advertisement;

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

(iii) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding;

(iv) CSA W59, Welded Steel Construction (Metal Arc Welding);

(v) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles;

(vi) CSA W47.1, Certification of Companies for Fusion Welding of Steel;

(vii) ASTM A36, Standard Specification for Carbon Structural Steel;

(viii) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless;

(ix) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;

(x) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products;

(xi) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes;

(xii) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service;

(xiii) ASTM F3125, High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength;

(xiv) ASTM A404, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings;

(xv) ASTM A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use;

(xvi) ASTM A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement;

(xvii) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

(xviii) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding;

(xix) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service;

(xx) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered;

(xxi) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement;

(xxii) ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;

(xxiii) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables;

(xxiv) ASTM B29, Standard Specification for Refined Lead;

(xxv) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use;

(xxvi) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay);

(xxvii) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code;

(xxviii) AWS D1.1, Structural Welding Code – Steel;

(xxix) AWS D1.6, Structural Welding Code – Stainless Steel.

E18.3 Scope of Work

(a) The Work under this Specification shall include:

(i) Fabrication and installation of steel ice breaker nosing and associated hardware; all hot dip galvanized.

(ii) Supply and installation of shear connectors at the top of sheet pile

E18.4 Submittals

E18.4.1 The Contractor shall submit the following to the Contract Administrator:

(a) Copies of Mill Test Certificates showing chemical analysis and physical tests of all miscellaneous metal prior to commencement of fabrication. Miscellaneous metal without this certification will be rejected.

(b) Certification of chemical analysis and physical tests for all materials;

(c) A complete set of Shop Drawings prior to commencement of fabrication. The Contractor shall indicate on the Shop Drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the Drawings and Specifications. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings. In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings.

(d) Clearly indicate shop and erection details including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.

(e) Shop Drawings shall be drawn to the same system (Metric or Imperial) as the Contract Drawings.

(f) Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

E18.5 Materials

E18.5.1 General

(a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

(b) 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.

(c) The types and grades of structural steel used shall be as shown on the Drawings or as specified in this Specification.

(d) Materials called for under these Specifications and on the Drawings shall, unless otherwise specified, satisfy the testing procedures and be in strict accordance with the requirements set out in the latest edition of the standards identified.

E18.5.2 General Requirements for 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.

(b) Furnish to the Contract Administrator’s Shop Inspector mill test reports, properly correlated to all steel sections to be used for steel construction under this Specification.

(c) Fabrication shall be carried out in the Fabricator's own plant, the use of subcontractors for all or portions of the fabrication will only be considered unless applied for in writing by the Fabricator and subsequently approved in writing by the Contract Administrator. The Fabricator shall be fully responsible for the quality of work and shall bear all additional costs related to work being carried out at the subcontractors plant such as additional quality inspections, shipment, etc.

(d) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested

and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate. The mill test certificate shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.

E18.5.3 Miscellaneous Metals

(a) Structural steel for all components of the miscellaneous metals shall be in accordance with CSA standard G40.21M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to three hundredths of a percent (0 to 0.03%) or fifteen hundredths of twenty-two hundredths of a percent (0.15 to 0.22%) for ice breaker nosings, and to less than three tenths of a percent (0.3%) for all other steel components.

E18.5.4 Steel plates and threaded roads

(a) Shall be supplied and installed by the Contractor as shown on the Drawings.

E18.5.5 Welded Steel Construction

(a) Welded steel construction (Metal Arc Welding) shall conform to the requirements and satisfy the testing procedures of CSA W59, AWS D1.6 and Welded Highway & Railway Bridges - AWS D1.1 of The American Welding Society & Addendum.

E18.5.6 Shear Stud Connectors

(a) Shear connectors shall be of a headed stud type supplied according to CAN/CSA W59, Appendix H.

(b) Shear connectors shall meet the requirements of ASTM Standard A108, Grades 1018 or 1020. All shear connectors shall meet the mechanical properties of AWS specifications D1.5 Table 7.1 for type B studs.

E18.5.7 Zinc

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

E18.6 Equipment

E18.6.1 General

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

E18.7 Construction Methods

E18.7.1 Fabrication

(a) General

(i) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(ii) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(iii) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.

(iv) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(v) Cutting shall be in accordance with AWS D1.1, D1.6 and CSA W59.

(b) Clean Material

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

(c) Finish

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

(d) Bending

(i) When bending is necessary in order to meet the requirements of the design, it shall be done with care and by methods subject to the approval of the Contract Administrator. The bend line shall be at right angles to the direction of rolling.

(ii) The internal radius of bend of load carrying sections shall not be less than twice the thickness of the bend section when bent cold, and if a smaller radius of bend is essential, the material shall be bent hot and later annealed. Before bending, the edges of the section in the region of the bend shall be smoothed and rounded to a radius of 2 mm.

(e) Welding

(i) Specifications

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

(ii) Welding Operator Qualification

- Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. Qualification shall have been issued within two (2) years of commencement of fabrication.

(iii) The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he will use and all pertinent data of the tests. Evidence that the welding operators have been executing satisfactory welding in the required processes within the six (6) month period immediately prior to commencement of fabrication shall also be provided to the Contract Administrator. The Contractor shall bear the whole cost and be fully responsible for the qualification of all welding operators.

(f) 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.

(g) 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 or AWS A5.5 and the CAN/CSA W48 Specification and be capable of producing weld metal having an impact strength of at least 27 J (Charpy V-Notch) at minus eighteen degrees Celsius (-18oC).

(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, A5.18 or A5.20 and CAN/CSA W48 and be capable of producing weld metal having a minimum impact strength of 27 J (Charpy V Notch) at minus eighteen degrees Celsius (-18oC), or shall be capable of producing low alloy weld metal having the mechanical properties listed in Table 4.1.1 of 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, A5.18, or A5.20) 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 & delivered in hermetically sealed containers or shall be dried for at least two (2) hours between two hundred and thirty degrees Celsius (230°C) and two hundred and sixty degrees Celsius (260°C) before they are used. Electrodes conforming to AWS A5.5 shall be purchased & delivered in hermetically sealed containers or shall be dried one (1) hour and fifteen

(vii) (15) minutes at a temperature of four hundred and twenty-five degrees Celsius (425°C) + fifteen degrees Celsius (15°C) before being used.

(viii) 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 1 hour + 15 min. at a temperature of four hundred and twenty-five degrees Celsius (425°C)+ fifteen degrees Celsius (15°C) before being used.

(ix) Electrodes shall be dried prior to use if the hermetically sealed container shows evidence of damage. Immediately after removal from hermetically sealed containers or from drying ovens, electrodes shall be stored in ovens held at a temperature of at least one hundred and twenty degrees Celsius (120ºC). E70XX electrodes that are not used within four (4) hours, E80XX within two (2) hours, E90XX within one (1) hour, and E100XX and E110XX within 0.5 hour after removal from hermetically sealed containers or removal from a drying or storage oven shall be re-dried before use. In humid atmospheres, these time limits will be reduced as directed by the Contract Administrator. Electrodes that have been wet shall not be used. Electrodes shall be re-dried no more than once.

(x) Flux used for submerged arc welding shall be non-hygroscopic, dry and free of contamination from dirt, mill-scale, or other foreign material. All flux shall be purchased in moisture-proof packages capable of being stored under normal conditions for at least six (6) months without such storage affecting its welding characteristics or weld properties.

(xi) Flux from packages damaged in transit or handling shall be discarded or shall be dried before use at a minimum temperature of one hundred and twenty degrees Celsius (120°C) for one (1) hour. Flux shall be placed in the dispensing system immediately upon opening a package. If flux is used from an open package or an open hopper that has been inoperative for four (4) hours or more, the top 25 mm shall be discarded. Flux that has been wet shall not be used. Flux fused in welding shall not be reused.

(h) 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.

(i) 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.

Base Metal	Welding Process					Base Metal
	SMAW		GMAW	FCAW	SAW	
CSA	CSA	CSA	CSA	CSA	CSA	
G40.21M	W48.1	W48.3	W48.4	W48.5	W48.6	ASTM
	AWS	AWS	AWS	AWS	AWS	
	A.5.1	A5.5	A5.18,5.28	A5.20	A5.17,5.23	
230G	E60XX		E70S-X	E60T-X	F6X-XXX	A53 Gr B
260W,260T	E70XX		E70U-X	E70T-X	F7X-XXXX	A500 Gr A
						A516Gr55,60
						A36
300W	E70XX		E70S-X	E70T-X[a]	F7X-XXXX	A441>4"
300T	or	E70XX		or	or	A550GrB
	E60XX		E70U-X	F60T-X	F6X-XXXX	A501
350G[d]						A529
350W						A570Gr D,E
						A572Gr42,45
						A607Gr45
						A242
						A441#4"
						A516Gr65,70
350R[b,c]			E70S-X			A570Gr50,55
350A[b,c]	E70XX	E70XX		E70T-X[a]		588[c]
			E70U-X		F7X-XXXX	A606
						A607Gr50,55
400A[b,c]						A618
						A633Gr,A,B, C,D
400G[d],400W						
400T		E80XX	GrE80S	GrE80T	GrF80	A572Gr60,65
480W		E90XX	GrE90S	Gr390T	GrF90	
480T						
480A[b,d]		E100XX	GrE100S	GrE100T	GrF100	
700Q[d]		E110XX	GrE110S	Gr3110T	GrF110	A514
						A517

Footnotes for Matching of Base Metal and Electrode Combinations

a) Exclusive of E70T-2, E70T-3, E70T0-G

b) When steels of Types R and A are used in the exposed, bare, unpainted condition, the electrodes suggested or others producing a similar alloy composition in the deposited metal should be used. For applications where the material is not boldly exposed, where a colour match is not important, for all but capping passes in multipass welds and for narrow single pass welds, the electrodes suggested for Grades 300T, 400T and 480T may be used (See CAN/CSA G40.21M).

c) See Clauses 5.2.1.4 and 5.2.1.5 and Table 5-2 of CSA W59.

d) See Mfg. Specifications.

Use of the same-type filler metal having the next higher mechanical properties as listed in the AWS or CSA Specifications is permitted:

.1 In joints involving base metals of different yield points or strength, filler metal applicable to the lower strength base metal may be used subject to the Contract Administrator's approval.

.2 When welds are to be stress relieved, the deposited weld metal shall not exceed 0.05% vanadium.

.3 See AWS D1.1 article 4.20 for Electroslag and Electrogas weld metal requirements. Appendix C Impact Requirements are mandatory.

.4 Lower strength filler metal may be used for fillet welds and partial penetration groove welds when indicated on the plans or in the special provisions.

(j) 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 and twenty degrees Celsius (120°C), 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.

(k) Tack Welding

(i) All tack welds shall be a minimum of 10 mm in length and made with low hydrogen electrodes and shall not be incorporated in the final structure without specific written authorization by the Contract Administrator.

(l) Stud Shear Connectors

(i) The accessories, equipment and welding procedures for the installation of the shear connectors shall be in accordance with AWS D1.1 and CSA W59. Welding by hand will not be allowed.

(m) Hot-Dip Galvanizing

(i) Galvanizing, when called for on the Drawings, shall be done in accordance with ASTM A123 and CSA G164;

(ii) The ice breaker nosing shall be hot dip galvanized.

(n) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material to SSPC – SP 6 (sand, grit or shop blasting or pickling) prior to galvanizing.

(o) Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling to SSPC – SP 1.

E18.7.2 Handling, Delivery, and Storage of Materials

(a) Precautionary measures shall be taken to avoid damage to miscellaneous metal during handling, transit, stockpiling and erecting. Pinholes, or other field connection holes shall not be used for lifting purposes. Special attention is directed to the shipping and storing of miscellaneous metal.

(b) Damaged parts shall not be installed in the structure and may be rejected at the discretion of the Contract Administrator.

(c) Materials that are not placed directly in the structure shall be stored above probable high water, on skids, platforms or in bins in a manner that will prevent distortion or the accumulation of water or dirt on the miscellaneous metal. The materials shall be kept separate and stored properly for ease of inspection, checking and handling and shall be drained and protected from corrosion.

E18.7.3 Erection

(a) Layout

(i) Before erection of miscellaneous metal, the Contractor shall satisfy himself that the installation locations are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

(b) Workmanship

(i) The parts shall be assembled as shown on the Drawings and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken or otherwise damaged.

(ii) 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,D1.6 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.

E18.8 Quality Control and Assurance

E18.8.1 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.

(i) Welding

- 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.

(ii) The Contractor shall provide sufficient access and shop area to permit the performance of the tests.

(iii) The Contractor shall give the Contract Administrator not less than twenty-four (24) hours' notice of when work will be ready for testing and shall advise the Contract Administrator of the type and quantity of work that will be ready for testing.

(iv) All defects revealed shall be repaired by the Contractor at their own expense and to the approval of the Contract Administrator.

E18.8.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, if, in the opinion of the Contract Administrator, the materials involved do not meet the requirements of the Drawings and this Specification.

(b) All materials shall be subject to testing by the Contract Administrator and will be approved only if the requirements of the Drawings, standards and this Specification are met. The Contractor shall supply the specimens for testing in accordance with the requests of the Contract Administrator.

(c) The Contractor shall furnish facilities for the inspection of material and workmanship in the mill, shop and field, and the Contract Administrator shall be allowed free access to the necessary parts of the Works.

E18.9 Measurement and Payment

E18.9.1 Fabrication and Installation of Steel Ice Breaker Nosing

(a) Supply, fabrication and erection of Steel Ice Breaker Nosing will not be measured. This Work shall be paid for at the Contract Lump Sum Price per Parts 1 and 2 for “Fabrication and Installation of Steel Ice Breaker Nosing”, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E18.9.2 Supply and Installation of Shear Studs

(a) Supply and Installation of shear studs on the sheet piling will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Supply and Installation of Shear Studs”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in the Specification, accepted and measured by the Contract Administrator.