THE CITY OF WINNIPEG

TENDER

TENDER NO. 335-2023

CREEK BEND ROAD BRIDGE REPLACEMENT AND RELATED WORKS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 CREEK BEND ROAD BRIDGE REPLACEMENT AND RELATED WORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 29, 2023.

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

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the 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 City and approved by the Contract Administrator.

B3.3 The Bidder/Proponent is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid/Proposal or their performance of the Work, and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection.

B4. ENQUIRIES

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

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

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

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

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

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

B5. CONFIDENTIALITY

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

(a) was known to the Bidder before receipt hereof; 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 D6.

B7. SUBSTITUTES

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

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

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

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

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

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

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

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

(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.

B10.1.1 The Bidder shall state the Approximate Quantity for item E a) Initial Span on Form B: Prices in accordance with D29.

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

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

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

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

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

B11. DISCLOSURE

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

B11.2 The Persons are:

(a) N/A

B12. CONFLICT OF INTEREST AND GOOD FAITH

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

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

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

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

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

(e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of 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, Materials Management Division website at https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

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

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

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

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

(d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and D8);

(e) Precast concrete manufacturers shall be certified to Canadian Precast Concrete Quality Assurance (CPCQA) Certification Program in Precast and Prestressed Bridge Products, B, Subcategory B4 prior to the time of bid; and

(f) Fabricators and erectors responsible for welding structures fabricated or erected under this contract shall be certified by the Canadian Welding Bureau to the requirements of CSA W47.1 (Division 1 or Division 2), CSA W55.3, or both, as applicable.

B13.4 Further to B13.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

(a) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information

Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/.

B13.5 Further to B13.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at http://www.accessibilitymb.ca/training.html for anyone that may have any interaction with the public on behalf of the City of Winnipeg.

B13.6 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B13.7 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

B14.1 The Bidder shall include in their Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf.

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

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

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

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

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

(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 at any time prior to the Submission Deadline.

B18. EVALUATION OF BIDS

B18.1 Award of the Contract shall be based on the following bid evaluation criteria:

(a) compliance by the Bidder with the requirements of the Tender, or acceptable deviation there from (pass/fail);

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

(c) Total Bid Price;

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

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

B18.3 Further to B18.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in 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 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B18.4.2 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.

B18.4.3 Further to B18.1(c), the Total Bid Price shall include Site Occupancy Costs as shown on Form B: Prices. Site Occupancy Costs shall be the Initial Span bid in the Working Days, multiplied by the Site Occupancy Unit Price listed in Form B: Prices.

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 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.

B19.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of their Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The *General Conditions for Construction* (Revision 2020-01-31) are applicable to the Work of the Contract.

C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. FORM OF CONTRACT DOCUMENTS

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

D3. SCOPE OF WORK

D3.1 The major components of the Work are as follows:

(a) Structural Works
- (i) Demolition and removal of existing bridge;
- (ii) Excavation and backfill;
- (iii) Steel piling;
- (iv) Precast wingwalls and abutment backwalls;
- (v) Riprap;
- (vi) Steel pile caps;
- (vii) Prestressed precast concrete channel girder;
- (viii) Cast-in-place concrete deck and barriers;
- (ix) Aluminum barrier rail and bicycle rail;
- (x) Asphalt waterproofing and paving;
- (xi) Gabion and retaining wall.

(b) Roadworks
- (i) Excavation (with bench cuts and stripping topsoil);
- (ii) Compaction of sub-grade;
- (iii) Installation of catch basins and sewer service pipe;
- (iv) Installation of separation/ filtration geotextile fabric and Class A geogrid;
- (v) Placement of sub-base and base course materials;
- (vi) Supply and installation of 600 mm corrugated steel pipe with bevelled ends;
- (vii) Construction of integral concrete modified barrier curb (180 mm height) and concrete transition curb;
- (viii) Construction of 150 mm reinforced concrete pavement;
- (ix) Construction of 75 mm Type 1A asphalt path;
- (x) Construction of 100 mm Type 1A asphalt pavement;
- (xi) Construction of 100 mm concrete sidewalk;
- (xii) Granular Resurfacing;
- (xiii) Installation of Aluminum Balanced Barrier posts and rail; and
- (xiv) Topsoil and Sod.

(c) Landscaping
- (i) Excavation (stripping of topsoil) at bench location;
- (ii) Supply and install bench;
- (iii) Supply and install crushed limestone seating node;

(iv) Supply and install waste receptacle;
(v) Grass seeding; and
(vi) Tree planting.

(d) Manitoba Hydro Works and Streetlighting

(e) Restoration.

D3.2 The following shall apply to the Work:

(a) Universal Design Policy

http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=3604

D4. SITE INVESTIGATION DUE DILIGENCE AND RISK

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

(a) the location of any utility which can be determined from the records or other information available at the offices of any public authority or person, including a municipal corporation and any board or commission thereof, having jurisdiction or control over the utility;

(b) the Site conditions, including but not limited to subsurface hazardous materials or other concealed physical conditions;

(c) the location, nature, quality or quantity of the materials to be removed or to be employed in the performance of the Work;

(d) the nature, quality or quantity of the Plant needed to perform the Work;

(e) all matters concerning access to the Site, power supplies, location of existing services, utilities or materials necessary for the completion of the Work; and

(f) all other matters which could in any way affect the performance of the Work;

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

D5. DEFINITIONS

D5.1 When used in this Tender:

(a) ”**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;

(d) **“Charged Day”** means the unit of measurement of time for Site Occupancy. For purposes of assessing Charged Days, a Charged Day will be equivalent to a Working Day as defined in C1.1 (tt);

(e) ”**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;

(f) **"Final Span"** means the number of Charged Days assessed for Site Occupancy as calculated pursuant to D29.3;

(g) "**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;

(h) **"Initial Span"** means the number of Working Days bid by the Contractor for Site Occupancy;

(i) "**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 Bid Opportunity shall apply to the Work;

(j) **"Site Occupancy"** means a system for monitoring and administering progress of the Work. Site Occupancy involves the Contract Administrator setting a completion date for the Work along with a daily Contract administration cost (Site Occupancy cost) for each Working Day the Contractor is able to Work. The Contractor bids the number of anticipated Working Days to complete the Work, and depending on the actual Working Days to complete the Work, there may be a bonus payment or deduction applied to the final payment;

(k) "**Supply Chain Disruption"** means an inability by the Contractor to obtain goods or services from third parties necessary to perform the Work of the Contract within the schedule specified therein, despite the Contractor making all reasonable commercial efforts to procure same. Contractors are advised that increased costs do not, in and of themselves, amount to a Supply Chain Disruption.

D6. CONTRACT ADMINISTRATOR

D6.1 The Contract Administrator is Morrison Hershfield Limited, represented by:

Noëlle Vialoux, P. Eng.
Structural Engineer

Telephone No. 204-977-8370
Email Address NVialoux@morrisonhershfield.com

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

D7. CONTRACTOR'S SUPERVISOR

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

D7.2 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 D7.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D8. ACCESSIBLE CUSTOMER SERVICE REQUIREMENTS

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

D8.1.1 The Contractor agrees to comply with the accessible customer service obligations under the CSSR and further agrees that when providing the Goods or Services or otherwise

acting on the City of Winnipeg's behalf, shall comply with all obligations under the AMA applicable to public sector bodies.

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

(a) providing barrier-free access to goods and services;

(b) providing reasonable accommodations;

(c) reasonably accommodating assistive devices, support persons, and support animals;

(d) providing accessibility features e.g. ramps, wide aisles, accessible washrooms, power doors and elevators;

(e) inform the public when accessibility features are not available;

(f) providing a mechanism or process for receiving and responding to public feedback on the accessibility of all goods and services; and

(g) providing adequate training of staff and documentation of same.

D9. UNFAIR LABOUR PRACTICES

D9.1 Further to C3.2, the Contractor declares that in bidding for the Work and in entering into this Contract, the Contractor and any proposed Subcontractor(s) conduct their respective business in accordance with established international codes embodied in United Nations Universal Declaration of Human Rights (UDHR) https://www.un.org/en/about-us/universal-declaration-of-human-rights International Labour Organization (ILO) https://www.ilo.org/global/lang--en/index.htm conventions as ratified by Canada.

D9.2 The City of Winnipeg is committed and requires its Contractors and their Subcontractors, to be committed to upholding and promoting international human and labour rights, including fundamental principles and rights at work covered by ILO eight (8) fundamental conventions and the United Nations Universal Declaration of Human Rights which includes child and forced labour.

D9.3 Upon request from the Contract Administrator, the Contractor shall provide disclosure of the sources (by company and country) of the raw materials used in the Work and a description of the manufacturing environment or processes (labour unions, minimum wages, safety, etc.).

D9.4 Failure to provide the evidence required under D9.3, may be determined to be an event of default in accordance with C18.

D9.5 In the event that the City, in its sole discretion, determines the Contractor to have violated the requirements of this section, it will be considered a fundamental breach of the Contract and the Contractor shall pay to the City a sum specified by the Contract Administrator in writing ("Unfair Labour Practice Penalty"). Such a violation shall also be considered an Event of Default, and shall entitle the City to pursue all other remedies it is entitled to in connection with same pursuant to the Contract.

D9.5.1 The Unfair Labour Practice Penalty shall be such a sum as determined appropriate by the City, having due regard to the gravity of the Contractor's violation of the above requirements, any cost of obtaining replacement goods/ services or rectification of the breach, and the impact upon the City's reputation in the eyes of the public as a result of same.

D9.5.2 The Contractor shall pay the Unfair Labour Practice Penalty to the City within thirty (30) Calendar Days of receiving a demand for same in accordance with D9.5. The City may also hold back the amount of the Unfair Labour Practice Penalty from payment for any amount it owes the Contractor.

D9.5.3 The obligations and rights conveyed by this clause survive the expiry or termination of this Contract, and may be exercised by the City following the performance of the Work, should the City determine, that a violation by the Contractor of the above clauses has occurred

following same. In no instance shall the Unfair Labour Practice Penalty exceed the total of twice the Contract value.

D10. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D11. AUTHORITY TO CARRY ON BUSINESS

D11.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D12. SAFE WORK PLAN

D12.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D12.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D12.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at their sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D13. INSURANCE

D13.1 The Contractor shall provide and maintain the following insurance coverage:

(a) commercial general liability insurance, in the amount of at least five million dollars ($5,000,000.00) inclusive, with the City and Manitoba and its Ministers, officers, employees and agents added as additional insureds, with a cross-liability clause. Such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, Contractors and owners' protective, sudden and accidental pollution 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 $5,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.

(c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written jointly in the names of the Contractor, the City, and all sub-Contractors at all times during the performance of the Work and until the date of Substantial Performance.

(d) Contractor's pollution liability insurance in the minimum amount of one million dollars ($1,000,000) per occurrence and two million dollars ($2,000,000) aggregate insuring against claims covering third-party injury and property damage claims including clean-up costs and transported cargo as a result of pollution conditions arising suddenly or gradually

from the operations and completed operations. Such policy to name the City as an additional insured.

D13.2 Deductibles shall be borne by the Contractor.

D13.3 The certificate of insurance for the commercial general liability insurance must clearly state "operations to include "demolition work"

D13.4 All subcontractors performing work on the project shall provide the Contractor with evidence of insurances as outlined in D13.1(a) and D13.1(b) above and be registered with Workers Compensation Board of Manitoba. Such evidence to be maintained during the performance of the work. The Contractor shall provide the contract administrator with evidence of the same prior to the commencement of any work.

D13.5 All policies shall be taken out with insurers licensed in the Province of Manitoba.

D13.6 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, as applicable.

D13.7 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D14. CONTRACT SECURITY

D14.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond until the expiration of the warranty period in the form of:

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

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

D14.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

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

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

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

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

(e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D14.1(b).

D14.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in their discretion, exercised reasonably, allows.

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

D14.2 The Contractor shall provide the Contract Administrator identified in D6 with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D14.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) give the Subcontractor written notice of the existence of the labour and material payment bond in D14.1(b); and

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

D15. SUBCONTRACTOR LIST

D15.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract Documents, if applicable.

D16. EQUIPMENT LIST

D16.1 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 but in no event later than the date specified in the C4.1 for the return of the executed Contract Documents, if applicable.

D17. DETAILED WORK SCHEDULE

D17.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D17.2 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.

D17.3 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.

D17.4 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.

D17.5 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;

(c) capacity to show simultaneously the planned baseline schedule as well as the update schedule for each activity/task;

(d) all acceptable to the Contract Administrator.

D17.6 Further to D17.5(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) Sequence of Work as described in D24, including the anticipated spring 2024 seasonal shutdown;

(d) Critical Stages as listed in D25;

(e) Substantial Performance;

(f) Total Performance;

(g) Demobilization from Site.

D17.7 Landscaping Maintenance and other Maintenance

D17.8 Further to D17.5(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.

D17.9 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”.

D17.10 Contractor shall provide sub-schedules to define critical portions of the Work upon reasonable request from the Contract Administrator.

D18. REQUIREMENTS FOR SITE ACCESSIBILITY PLAN

D18.1 The Contractor shall provide the Contract Administrator with an Accessibility Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D18.2 Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

(a) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.

(b) Any required detour signage.

D18.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.

D18.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:

(a) Signage

(b) Temporary Ramping

(c) Detour Signage

D18.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure that all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.

D18.6 Any changes to the Accessibility Plan must be approved by the Contract Administrator.

D18.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

D18.8 Deficiencies as a direct result of actions by the Contractor that are not immediately corrected and/or failure to produce records that demonstrate that the site was maintained in compliance with the Accessibility Plan may result in a pay adjustment via the monthly Progress Payment. The rate of pay adjustment will be as per the following schedule:

(a) First Offence – A warning will be issued and documented in the weekly or bi-weekly site meeting.

(b) Second Offence – A field instruction to immediately correct the site will be issued by the Contract Administrator.

(c) Third and subsequent Offences – A pay reduction will be issued in the amount of $250.00 per instance and per day.

D19. ENVIRONMENTAL PROTECTION PLAN

D19.1 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. In addition to the Environmental Protection Plan, the Transport Canada approval letter and DFO letter of advice must be posted on site during construction.

D19.2 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) Fisheries Act C.F-14;
- (iv) Hazardous Products Act C.H.-3;
- (v) Transportation of Dangerous Goods Act and Regulations C.34;
- (vi) Migratory Birds Convention Act and Regulations, c. 22;
- (vii) Species at Risk Act, c. 29;
- (viii) And any other applicable Acts, Regulations and By-laws;
- (ix) Applicable Fisheries and Oceans Canada (DFO) Operational Statements for Manitoba for stream crossings and bridge works;
- (x) The DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines, DFO 1995;
- (xi) DFO Policy for the Management of Fish Habitat 1986;
- (xii) Federal Policy on Wetland Conservation 1991;
- (xiii) 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) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish
(xiii) Habitat, Manitoba Natural Resources and DFO, 1996;
(xiv) And current applicable associated regulations;
(xv) 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 Best Management Practices Handbook for Activities In and Around the City's Waterways and Watercourses, City of Winnipeg, 2005;
(iv) City of Winnipeg Motor Vehicle Noise Policies and Guidelines;
(v) The City of Winnipeg Sewer By-law No. 92/2010 and all amendments;
(vi) The City of Winnipeg Waterway By-law 5888/92;
(vii) Any other applicable Acts, Regulations, and By-laws and associated updates and amendments.

D19.3 The Contractor is advised that the following environmental protection measures apply to the Work.

D19.3.1 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 watercourses 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 watercourses. Debris will be removed by hand or with machinery operated from shore or a floating barge. 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.

D19.3.2 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 any temporary fuel storage areas established for construction of the project are contained by an impermeable dike and are located a minimum distance of 100 m away from Seine River and any other watercourse. Dikes will be designed, constructed, and maintained to retain not less than one hundred percent (100%) of the capacity of the total number of containers or one hundred and

ten percent (110%) of the largest container, whichever is greatest. The dikes will be constructed of clay or similar impervious material. If this type of material is not available, the dike will be constructed of locally available material and lined with high density polyethylene (HDPE). Furthermore, the fuel storage area(s) will be secured by a barrier such as a high fence and gate to prevent vandalism.

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

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

(g) 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.

(h) Wash, refuel and service machinery and store fuel and other materials for the machinery a minimum of 100 m away from watercourses to prevent deleterious substances from entering the water.

(i) 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.

(j) 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.

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

(l) 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.

D19.3.3 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) Runoff from a waste storage area will not be allowed to cause siltation of a watercourse.

(m) 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.

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

(o) 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.

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

D19.3.4 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) Runoff from a dangerous goods/hazardous waste storage area will not be allowed to cause siltation of a watercourse.

(l) 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.

D19.3.5 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 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:

I. Identify exact location and time of the accident.

II. Indicate injuries, if any.

III. 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:

I. Stop traffic, roadblock/cordon off the immediate danger area.

II. Eliminate ignition sources.

III. Initiate evacuation procedures if necessary.

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

I. Personnel on Site.

II. Cause and effect of spill.

III. Estimated extent of damage.

IV. Amount and type of material involved.

V. Proximity to waterways, sewers and manholes.

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

I. Approach from upwind.

II. Stop or reduce leak if safe to do so.

III. Dike spill material with dry, inert absorbent material or dry clay soil or sand.

IV. Prevent spill material from entering waterways and utilities by dyking.

V. 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 D19-1: 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	100 L*

	(Flammable)	
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

D19.3.6 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.

D19.3.7 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.

D19.3.8 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.

D19.3.9 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.

D19.3.10 Fish

(a) The Contractor will adhere to all of the protection measures below, in keeping with the provisions of the Fisheries Act and DFO's mandate for the prevention of serious harm to fish. The Contractor will also adhere to the conditions provided in the DFO authorization for the Works.

(b) Due to the presence of spawning fish species no in-stream works will occur between April 1 and June 15 of any given year.

(c) If possible, bridge works will be constructed during periods of no flow or very low flow. Flowing water should be diverted around the construction area using a dam and bypass pump or temporary flume (culvert). Water will be diverted in a manner that avoids sediment generation to downstream areas and does not alter the volume of flow in the watercourse. Use coffer dams made of non-earthen material such as aquadams, sand bags, sheet pile or clean granular material wrapped in poly-plastic or other suitable isolation materials. Ensure the DFO Interim Code of Practice for Temporary Cofferdams and Diversion Channels is followed. Ensure any pump inlets are appropriately screened following the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines. Ensure all isolation materials are completely removed from the watercourse once construction is complete.

(d) Any fish trapped within the isolated area will be captured and returned to the watercourse unharmed. Fish includes fin fish, crayfish and mussels (clams).

(e) All bridge works will be limited to within road's right-of-way.

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

(g) Culvert stormwater outfalls will be installed according to the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat (Manitoba Natural Resources and DFO, 1996) and will include an erosion and sediment control plan and mitigation to prevent the release or transport of deleterious substances to the river.

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

(i) Use only clean rock for armouring the channel areas, and haul it in from an appropriate land-based source. Avoid using poor quality limestone that breaks down quickly when exposed to the elements or acid generating rocks typical from metal mines. All rock will be clean and free of fine materials and of appropriate size to resist displacement during high flow events.

(j) The rock is placed such that it does not constrict the channel or change the hydraulics in a way that might damage the bed and/or banks of the watercourse or interfere with fish passage.

(k) Where grading of stream banks is required they are sloped by pulling material back from the water's edge. Stabilize any waste materials removed from the Work site, above the ordinary high water mark, to prevent them from entering any water body. Spoil piles could be contained with silt fence, flattened, covered with biodegradable mats or tarps, and/or planted with preferably native grass or shrubs.

(l) Shoreline vegetation will be retained to the greatest extent possible to maximize the stability of the banks.

(m) Machinery will be operated from outside of the water and in a manner that minimizes disturbance to the banks of the water body.

(n) The intake of any pumps used in surface waters will be screened to meet the DFOs Freshwater Intake End-of-Pipe Fish Screening Guidelines (1995).

(o) All equipment must be cleaned, drained, and dried before and after use in water to prevent the spread of aquatic invasive species. Organisms will not be moved from one body of water to another.

D19.3.11 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), as described in Section D17.

(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.

D19.3.12 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.

D19.3.13 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.

D19.3.14 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.

D19.3.15 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 their 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.

D19.3.16 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.

D19.3.17 Access

(a) The Contractor will maintain access to affected residential properties.

(b) The Contractor will provide or maintain general and off-street access to any affected business during construction.

D19.3.18 Transport Canada

(a) All vessels navigating the watercourse must be allowed access through or around the work site at all times during construction and must be assisted as necessary.

(b) Signs stating “Construction Ahead” must:

(i) Be placed and maintained 50 metres upstream and downstream of the work;

(ii) Be legible from a minimum distance of 50 metres;

(iii) Display black lettering on a yellow or orange background.

(iv) Be placed and maintained during all periods of open water and in-stream activity.

(c) All portions of the existing work and any previous works (e.g. timber piles) must be removed to an elevation at least 1 m below the natural bed of the waterway upon completion of the work(s).

(d) The Minister or his representatives must be allowed unimpeded access to any site related to the project for inspection and/or monitoring purposes.

D20. ENVIRONMENTAL PROTECTION PLAN – WATERWAYS PERMIT

D20.1 In addition to D19 the Waterways Permit will be issued once authorized by the City of Winnipeg, Planning, Property and Development Department, Waterways Section and will state conditions that the Contractor shall abide by.

D20.2 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.

D20.3 Notwithstanding the measurement and payment terms of Environmental Protection Plan – Waterways Permit during construction, including monitoring will be considered incidental to the all Work.

D21. SITE PLAN

D21.1 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.

D21.2 The Contractor shall submit a Site Plan for the Work to the Contract Administrator with:

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

(b) fenced laydown area locations including gates;

(c) staging areas for various types of work (Bridge, Roadworks, Landscaping, etc.);

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

(e) Temporary traffic control materials and signage showing the type and location as required by the Drawings and E7, including barricades and detour route for users of the frozen river in winter months.

SCHEDULE OF WORK

D22. COMMENCEMENT

D22.1 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.

D22.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
  (i) evidence of authority to carry on business specified in D11;
  (ii) evidence of the workers compensation coverage specified in C6.15;
  (iii) the twenty-four (24) hour emergency response phone number specified in D7.2
  (iv) the Safe Work Plan specified in D12;
  (v) evidence of the insurance specified in D13;
  (vi) the contract security specified in D14;
  (vii) the Subcontractor list specified in D15;
  (viii) the equipment list specified in D16;
  (ix) the detailed work schedule specified in D17;
  (x) the Requirements for Site Accessibility Plan specified in D18;
  (xi) the Environmental Protection Plan specified in D19 and D20;
  (xii) the Site Plan specified in D21; and
  (xiii) the direct deposit application form specified in D38.

(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.

D22.2.1 The City intends to award this Contract by October 6, 2023.

D22.2.2 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.

D23. WORK BY OTHERS

D23.1 Further to C6.25, 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.

D23.2 Work by others on or near the Site will include but not necessarily be limited to:

(a) Manitoba Hydro Power Pole and Overhead Line relocation. Approximate new pole locations are provided on the General Arrangement Drawing. These are subject to change.

(b) Watermain service to 180 Creek Bend Road

D23.2.1 Further to D23.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others identified in D23.1 and accommodate the necessary area on Site required for the Work by Others to complete the Work.

D24. SEQUENCE OF WORK

D24.1 Further to C6.1, the sequence of work shall be as follows:

(a) Complete clearing and grubbing work in accordance with D25.1(a). This work must be completed to allow Manitoba Hydro access to the site for relocation of overhead poles and lines, as shown on the General Arrangement Drawing which is anticipated to occur by December 31, 2023. No site occupancy days will be charged in association with the completion of the clearing and grubbing work.

(b) A Winter Phase is to occur over the winter of 2023-2024 and may include works including, but not limited to, demolition of the existing bridge, structural excavation, pile driving, steel bent construction, production of precast elements, abutment assembly, placement of rip-rip, girder erection, installation of land drainage components, etc.

(c) A seasonal shutdown is anticipated to occur in spring 2024, between the end of the Winter Phase, prior to the start of the Summer Phase, during which time elevated river levels and frost conditions may prevent work from occurring.

(d) A Summer Phase is to occur during the 2024 summer construction season once weather conditions allow for the resumption of surface works. The Summer Phase may include works including, but not limited, to forming and pouring cast-in-place structural concrete, waterproofing and bridge deck overlay paving, installation of gabion basket retaining wall, roadway excavation, placement of sub-base and base course, concrete and asphalt paving, installation of street lighting, landscaping, etc.

D25. CRITICAL STAGES

D25.1 The Contractor shall achieve Critical Stages of the Work in accordance with the following requirements:

(a) Clearing and grubbing of areas as shown on Drawing P-3567-01 complete by October 31, 2023.

(b) Complete all in-water works and return the Seine River to a navigable condition by March 1, 2024.

D26. WORKING DAYS

D26.1 Notwithstanding C1.1(tt), a Working Day includes a Saturday, Sunday, or a statutory or civic holiday when the Contractor chooses to undertake Work requiring the presence of the Contract Administrator.

D26.2 Notwithstanding C1.1(tt), a Working Day on Saturdays, Sundays and statutory holidays will be from 09:00 to 19:00. If a Contractor wished to commence work earlier than 09:00 on Saturdays, Sundays and statutory holidays a noise by-law exemption to the neighbourhood livability by-law must be applied for, approved, and an in place. For the purposes of bidding, the bidder shall assume that Work may not commence until after 09:00 on weekends and statutory or civic holidays.

D26.3 Further to C1.1(tt), the Contract Administrator's determination of whether or not atmospheric and Site conditions are such that a Working Day is deemed to have elapsed may be based at one time on one type of Work while at another time a Working Day may be based on another type of work. When more than one type of major Work is involved, the quantity of equipment that must be able to work in order to meet the requirements of a Working Day may vary considerably from that specified in the General Conditions.

D26.4 In the event that incidental Work is behind schedule which, in the opinion of the Contract Administrator, should have been or could have been carried out by the Contractor in conjunction with or immediately following Work of a major type, the City hereby reserves the right to charge Working Days on the incidental Work until such time as it is up to schedule.

D26.5 When the major type of Work involves restoration of the site to the condition it was prior to rainfall, Working Days shall not be charged.

D26.6 The Contract Administrator will identify the Working Days charged during the regular site meetings.

D27. SUBSTANTIAL PERFORMANCE

D27.1 The Contractor shall achieve Substantial Performance by September 1, 2024.

D27.2 Substantial Performance will not be granted until the road and bridge are open to vehicular and pedestrian traffic.

D27.3 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D27.4 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.

D28. TOTAL PERFORMANCE

D28.1 The Contractor shall achieve Total Performance by October 1, 2024.

D28.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D28.3 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.

D29. SITE OCCUPANCY

D29.1 Definitions

D29.1.1 Wherever the following items are used, the intent and meaning will be interpreted as follows:

(a) Charged Days: Means the unit of measurement for time of Site Occupancy. For the purpose of assessing Charged Days, a Charged Day will be equivalent to a Working Day as defined in C1.1 (tt) and amended in D26.

(b) Initial Span: Means the number of Charged Days bid by the Contractor for Site Occupancy on Form B: Prices.

(c) Final Span: Means the number of Charged Days assessed for Site Occupancy as calculated pursuant to D29.2.1.

D29.2 Measurement

D29.2.1 Time shall be of the essence of the Contract. The Contractor shall provide the necessary material, labour and equipment to ensure that the Works will be completed within the consecutive amount of Working Days bid for Initial Span for Site Occupancy, and in no case later than the date specified for **Substantial Performance** for all Work. Failure to complete the Work within the Bid number of Working Days will result in the deduction of Site Occupancy costs, as further defined herein. The total amount of Working Days will be measured in whole numbers.

D29.2.2 Charged Days will be assessed for every day except for the following:

(a) Days prior to the Contractor starting Work on the Winter Phase of the Contract. The Contractor shall provide a minimum of fourteen (14) Calendar Days' notice to the City for Commencement of Winter Phase of the Work. Failure of the Contractor to Commence Work as indicated, in the opinion of the Contract Administrator, may result in the assessment of Charged Days equivalent to the estimated costs incurred to the City;

(b) Days not worked due to Force Majeure.

(c) Days between Substantial Performance and Total Performance.

D29.2.3 Further to D29.2.2, the Contractor will be permitted one (1) suspension of on-site construction activity and progress to allow for the spring 2024 seasonal shutdown; Charged Days will not be charged during this period. During this period, the Contractor will remain responsible for and in full care and control of the site, access to nearby properties must be maintained, road closures and signage must be maintained, and all existing facilities and work in progress must be protected from weather, elevated river levels, or other potentially harmful effects. Changes to Contract completion dates resulting from suspension of Charged Days, will not be considered.

(a) The Contractor shall notify the Contract Administrator in writing when the spring 2024 seasonal shutdown commences.

(b) The Contractor shall provide a minimum of fourteen (14) Calendar Days' notice in writing to the Contract Administrator prior to restarting Summer Phase works.

D29.3 Final Span

D29.3.1 Extensions to the Initial Span will determine the Final Span and will be calculated as follows:

(a) Final Span = (F÷A) x I

(b) Where: Final Span = adjusted number of Charged Days allowed (a fraction of a day will be rounded up to a full day);

(i) F = Final Contract Amount (excluding Site Occupancy).

(ii) I = Initial Span of the Contract

(iii) A = Total amount at Award (excluding Site Occupancy and Provisional Items

D29.4 Site Occupancy Payment

D29.4.1 Payment for Site Occupancy for the Contract will be made as follows:

(a) If the number of Charged Days equals the Final Span, no payment or deduction will be made.

(b) If the number of Charged Days is less than the Final Span, a payment equal to the Contract Unit Price per Charged Day multiplied by the difference between the Final Span and the actual number of Charged Days, to a maximum amount of two percent (2%) of the Total Bid Price, will be made to the Contractor.

(c) If the number of Charged Days exceeds the Final Span, a deduction equal to the Contract Unit Price per Charged Day multiplied by the difference between the actual number of Charged Days and the Final Span will be made from the payment to the Contractor.

D30. LIQUIDATED DAMAGES

D30.1 If the Contractor fails to achieve, Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Critical Stage D25.1(a) – Two Thousand Five Hundred dollars ($2500.00);

(b) Critical Stage D25.1(b) – Two Thousand Five Hundred dollars ($2,500.00);

(c) Substantial Performance - Two Thousand Five Hundred dollars ($2,500.00);

(d) Total Performance - Two Thousand Five Hundred dollars ($2,500.00).

D30.2 The amounts specified for liquidated damages in D30.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve, Critical Stages, Substantial Performance or Total Performance by the days fixed herein for same.

D30.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D31. SUPPLY CHAIN DISRUPTION SCHEDULE DELAYS

D31.1 The City acknowledges that the schedule for this Contract may be impacted by the Supply Chain Disruption. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the delivery requirements and schedule identified in the Contract in close consultation with the Contract Administrator.

D31.2 If the Contractor is delayed in the performance of the Work by reason of the Supply Chain Disruption, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D31.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether a Supply Chain Disruption will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to a Supply Chain Disruption, including but not limited to ordering of Material or Goods, production and/or manufacturing schedules or availability of staff as appropriate.

D31.4 For any delay related to Supply Chain Disruption and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D31.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D31.5 The Work schedule, including the durations identified in D24 to D28 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D31.6 Where Work not previously identified is being carried over solely as a result of delays related to Supply Chain Disruption, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to Supply Chain Disruption, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D31.7 Any time or cost implications as a result of Supply Chain Disruption and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D32. SCHEDULED MAINTENANCE

D32.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Sod maintenance as specified in CW 3510;

(b) Tree maintenance as specified in E41;

(c) Reflective crack maintenance during the warranty period as specified in CW 3250.

D32.2 Determination of Critical Stages, Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D33. JOB MEETINGS

D33.1 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.

D33.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

D34. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D34.1 Further to C6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D35. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D35.1 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.

D36. LAYOUT OF THE STRUCTURAL WORKS

D36.1 The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Structural Work.

D36.2 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.

D36.3 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 their discretion.

D36.4 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 their own expense.

D36.5 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 replace by the Contract Administrator at the expense of the Contractor.

D37. LAYOUT OF THE ROAD WORKS

D37.1 Further to the City of Winnipeg Specifications GC 6.28(h), the Contract Administrator shall mark, to the extent determined to be necessary, the location, alignment and elevation of the Work by means of stakes or marks, and the Contractor shall make the completed Works conform to the lines and marks thus indicated.

D37.2 Stakes and marks required shall be provided no later than one (1) Business Day following the day on which the Contractor request such stakes, and/or marks, except where the Contractor's request is made immediately following asphalt planning operations. Then the Contract Administrator may require a maximum of two (2) Business Days to provide stakes and marks as a result of required adjustments to final design grades.

D37.3 The Contractor shall notify the Contract Administrator immediately of the disturbance of any such stakes or marks. The cost of correcting any errors arising out of neglect of the Contractor

to so notify the Contract Administrator shall be borne entirely by the Contractor, as well as the cost of replacing any disturbed stakes or marks.

D37.4 Before commencing Work, the Contractor shall satisfy themselves as to the meaning and correctness of all stakes and marks and no claims shall be entertained by the City on account of any alleged inaccuracies. If any error is suspected in the Drawings, Specifications or the directions of the Contract Administrator, Work shall be discontinued until the errors are rectified, but no claims shall be made on account of any delay occasioned thereby.

D37.5 The Contractor shall determine and provide all dimensions and elevations measured from the stakes or marks.

MEASUREMENT AND PAYMENT

D38. PAYMENT

D38.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

D38.2 Further to D29, no payment will be made for Site Occupancy, other than as set out in D29.4.1. Site Occupancy Amount on Form B: Prices will be used for evaluation of Bids.

D39. PAYMENT SCHEDULE

D39.1 Further to C12, payment shall be in accordance with the following payment schedule:

(a) Portions of Work designated for Lump Sum payment will be paid for on a monthly prorated basis as determined by the Contract Administrator in consultation with the Contractor provided the portion of the Work to be paid for has been permanently incorporated into the Works.

D40. FUEL PRICE ADJUSTMENT

D40.1 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.

D40.1.1 Eligible Work will be determined in accordance with D40.5.

D40.1.2 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.

D40.1.3 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.

D40.1.4 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.

D40.2 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.

D40.3 The fuel escalation or de-escalation adjustment will not be applied if the CFI is within ±15% of the BFI.

D40.4 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.

D40.5 The Fuel Factor (FF) rates will be set as follows:

(a) The Fuel Factor rate shall be set at 2.7% of the monetary value of all Work based on unit prices except for the portions of the Contract identified below;

(b) The Fuel Factor rate will be set at 1.9% of the monetary value for Structural Works identified on Form B: Prices related to bridges and structures Work.

WARRANTY

D41. WARRANTY

D41.1 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.

D41.2 Notwithstanding C13.2, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D41.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

DISPUTE RESOLUTION

D42. DISPUTE RESOLUTION

D42.1 If the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator, the Contractor shall act in accordance with the Contract Administrator's opinion, determination, or decision unless and until same is modified by the process followed by the parties pursuant to D42.

D42.2 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted"

D42.3 The entire text of C21.5 is deleted, and amended to read:

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

D42.4 Further to C21, prior to the Contract Administrator's issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator ("Dispute"):

(a) In the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor's equivalent representative to resolve Disputes within the normal course of

project dealings between the Contract Administrator and the Contractor's equivalent representative.

(b) Disputes which in the reasonable opinion of the Contract Administrator or the Contractor's equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:

(i) The Contract Administrator;

(ii) Supervisory level between the Contract Administrator and applicable Department Head;

(iii) Department Head.

D42.4.1 Names and positions of Contractor representatives equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.

D42.4.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.

D42.4.3 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.

D42.4.4 If the Dispute is not resolved to the City and Contractor's mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D42.4.3, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

INDEMNITY

D31. INDEMNITY

D31.1 Indemnity shall be as stated in C17.

D31.2 Notwithstanding C17.1, the Contractor shall save harmless and indemnify the City in the amount of twice the Contract Price or five million dollars ($5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the Contractor, their Subcontractors, employees or agents in the performance or purported performance of the Work, and more particularly from:

(a) accidental injury to or death of any person whether retained by or in the employ of the Contractor or not, arising directly or indirectly by reason of the performance of the Work, or by reason of any trespass on or damage to property;

(b) damage to any property owned in whole or in part by the City, or which the City by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, repair or maintain;

(c) damage to, or trespass or encroachment upon, property owned by persons other than the City;

(d) any claim for lien or trust claim served upon the City pursuant to The Builders' Liens Act;

(e) failure to pay a Workers Compensation assessment, or Federal or Provincial taxes;

(f) unauthorized use of any design, device, material or process covered by letters patent, copyright, trademark or trade name in connection with the Work;

(g) inaccuracies in any information provided to the City by the Contractor.

D31.3 Further to C17, The City shall save harmless and indemnify the Contractor in the amount of twice the Contract Price or five million dollars ($5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the City, their employees or agents in the performance of its obligation under the Contract.

THIRD PARTY AGREEMENTS

D32. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D32.1 Funding for the Work of the Contract is being provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada and accordingly, as required by the applicable funding agreements, the following terms and conditions shall apply.

D32.2 For the purposes of D32:

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

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

D32.3 Indemnification By Contractor

D32.3.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D32.3.2 The Contractor agrees that in no event will Canada or Manitoba, their respective officers, servants, employees or agents be held liable for any damages in contract, tort (including negligence) or otherwise, for:

(a) any injury to any person, including, but not limited to, death, economic loss or infringement of rights;

(b) any damage to or loss or destruction of property of any person; or

(c) any obligation of any person, including, but not limited to, any obligation arising from a loan, capital lease or other long term obligation;

in relation to this Contract or the Work.

D32.4 Records Retention and Audits

D32.4.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D32.4.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D32.4.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits,

to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D32.5 Other Obligations

D32.5.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D32.5.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D32.5.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D32.5.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

D32.5.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D32.5.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

FORM H1: PERFORMANCE BOND
(See D14)

KNOW EVERYONE BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 335-2023

CREEK BEND ROAD BRIDGE REPLACEMENT AND RELATED WORKS

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM H2: LABOUR AND MATERIAL PAYMENT BOND
(See D14)

KNOW EVERYONE BY THESE PRESENTS THAT

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

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

_____

_____ dollars ($_____.____)

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

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

TENDER NO. 335-2023

CREEK BEND ROAD BRIDGE REPLACEMENT AND RELATED WORKS

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

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

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

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

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

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

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

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

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

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

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

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

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM J: SUBCONTRACTOR LIST

(See D15)

CREEK BEND ROAD BRIDGE REPLACEMENT AND RELATED WORKS

Name	Address

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

E1.2 *The City of Winnipeg Standard Construction Specifications* in their entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Spec/Default.stm

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

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

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

E1.4 The following are applicable to the Work:

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B149-23-01	Cover Sheet – Location Plan & Drawing List	A1
B149-23-02	General Notes	A1
B149-23-03	Bore Hole Logs 1 Of 2	A1
B149-23-04	Bore Hole Logs 2 Of 2	A1
B149-23-05	Existing Conditions And Site Plan	A1
B149-23-06	Scope Of Work	A1
B149-23-07	General Arrangement	A1
B149-23-08	Foundation Plan	A1
B149-23-09	Abutment Details & Sections	A1
B149-23-10	Abutment - Corbel Details	A1

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B149-23-11	Abutment - Precast Panel Details	A1
B149-23-12	Abutment - Bill Of Reinforcing	A1
B149-23-13	Pier Details & Sections	A1
B149-23-14	Steel Pile Caps Details	A1
B149-23-15	Steel Pile Caps Details & Bill Of Materials	A1
B149-23-16	Girder Layout	A1
B149-23-17	Girder Concrete Details	A1
B149-23-18	Girder Prestressing & Bearing Recess Details	A1
B149-23-19	Girder Connection & Retaining Angle Details	A1
B149-23-20	Girder Reinforcing Details	A1
B149-23-21	Girder Bill Of Reinforcing & Misc. Metals	A1
B149-23-22	Bearing Layout & Details	A1
B149-23-23	Deck Layout & Concrete Details	A1
B149-23-24	Deck Reinforcing Layout	A1
B149-23-25	Deck Reinforcing Details	A1
B149-23-26	Deck Bill Of Reinforcing	A1
B149-23-27	Barrier Layout & Concrete Details	A1
B149-23-28	Exterior Barrier Reinforcing	A1
B149-23-29	Median Barrier Reinforcing	A1

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B149-23-30	Barrier Railing Details	A1
B149-23-31	Curb Layout & Details	A1
B149-23-32	Bicycle Railing Layout	A1
B149-23-33	Bicycle Railing Details	A1
B149-23-34	Barrier & Curb - Bill Of Reinforcing	A1
B149-23-35	Approach Slab Layout & Concrete Details	A1
B149-23-36	Approach Slab Reinforcing Details	A1
B149-23-37	Approach Bill Of Reinforcing	A1
B149-23-38	Plan And Profile	A1
B149-23-39	Cross Sections	A1
B149-23-40	Curb Concrete And Reinforcing Details	A1
B149-23-41	Bicycle Railing Details 1 Of 2	A1
B149-23-42	Bicycle Railing Details 2 Of 2	A1
P-3567-01	Creek Bend Road - Sta 0+280 To Sta 0+460	A1
P-3567-02	Creek Bend Road - Creek Bend Road To Sta 0+210	A1
P-3567-03	Creek Bend Road - Sta 0+210 To Seine River	A1
P-3567-04	Creek Bend Road – Sections	A1
P-3567-05	Creek Bend Road – Details	A1
P-3567-06	Creek Bend Road - Plan And Elevation	A1

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P-3567-07	Creek Bend Road - Details 2	A1
L-01	Creek Bend Road - Landscaping 1 Of 3	A1
L-02	Creek Bend Road - Landscaping 2 Of 3	A1
L-03	Creek Bend Road - Landscaping 3 Of 3	A1

E2. GEOTECHNICAL REPORT

E2.1 Further to C3.1, the Geotechnical Report is provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions. The Geotechnical Report is contained in Appendix 'A'.

E3. HYDROTECHNICAL REPORT

E3.1 Further to C3.1, the Hydrotechnical Report is provided to aid the Contractor's evaluation of the existing hydraulic conditions. The Hydrotechnical Report contained in Appendix 'B'.

GENERAL REQUIREMENTS

E4. OFFICE FACILITIES

E4.1 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 office shall be conveniently located near the site of the Work.

(c) The office shall be a newer building with a minimum floor area of 35 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 office 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 sixteen to eighteen degrees Celsius (16-18°C) or twenty-four to twenty-five degrees Celsius (24-25°C).

(e) The office shall be adequately lighted with fluorescent fixtures and have a minimum of ten – 120 volt ac electrical receptacles.

(f) The office shall be furnished with one (1) desk with chairs, one (1) drafting table with a stool, a table with chairs suitable to seat at least eight (8) people at a time for meetings, one (1) four (4) drawer, lockable legal size filing cabinet, and a minimum of ten (10) chairs.

(g) The office shall be equipped with reliable internet access, supplied and paid for by the Contractor, either provided by Ethernet cable (hard line) or wireless internet service. Any wireless internet access shall be secured by an access password and by conventional WPA2 256-bit encryption to prevent unauthorized access. If

wireless internet access is not provided, then a minimum of two Ethernet connections shall be provided.

(h) The field office(s) shall be equipped with a water cooler and be supplied so as never to run out of water. They shall be equipped with one (1) fridge, one (1) microwave, one electric tea kettle (1), and one (1) coffee maker.

(i) A portable toilet shall be located near the field office building.

(j) 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 he/she deems it necessary.

(k) A minimum of two parking stalls shall be made available for use by the Contract Administrator immediately adjacent to the site office.

(l) All site office facilities and furnishings shall be approved by the Contract Administrator.

E4.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E4.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance is completed.

E4.4 Equipment

E4.4.1 General

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

E5. MOBILIZATION AND DEMOBILIZATION PAYMENT

E5.1 Description

E5.1.1 This Specification covers all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E5.1.2 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.

E5.2 References

E5.2.1 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) CW 3550 – Chain Link and Drift Control Fence;

(d) Specification E4, Office Facilities; and

(e) Specification E7, Traffic Control and Management.

E5.3 Scope of Work

E5.3.1 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 E4;

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

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

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

(f) Restoring all existing facilities.

E5.4 Submittals

E5.4.1 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.

E5.5 Materials

E5.5.1 General

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

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

E5.6 Equipment

E5.6.1 General

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

E5.7 Construction Methods

E5.7.1 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.

E5.7.2 Cellular Telephone Communication

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

E5.7.3 Secure Site Fencing

(a) A minimum 1.8 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7 “Substitutes”, secure fence around the site laydown and Work site areas shall be installed prior to commencement of site activities.

(b) A minimum 1.25 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7 “Substitutes”, secure fence for work on or adjacent to private property where easements or permissions have been obtained.

(c) During winter months, a minimum 1.2 m high snow fence shall be installed on the river ice.

(d) The fencing shall remain secure and in place during all construction facilities.

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

E5.7.4 Traffic Gates

(a) The Contractor shall supply, install, maintain, and remove steel gates to keep non-Contract traffic and pedestrians out of the Work site, wherever required.

(b) The gates shall be removed upon completion of construction activities.

E5.7.5 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.

E5.7.6 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.

E5.8 Quality Control and Assurance

E5.8.1 Inspection

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

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

E5.8.2 Access

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

E5.9 Measurement and Payment

E5.9.1 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 for "Mobilization and Demobilization", 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) 30% when the Contract Administrator is satisfied that construction has commenced;

(ii) 60% during construction;

(iii) 10% upon completion of the Work.

E6. CASH ALLOWANCE FOR ADDITIONAL WORK

E6.1 Additional Work may be necessitated due to unforeseen circumstances that may arise during the course of the project due to:

E6.1.1 Additions to the scope of Work by the Contract Administrator, beyond that defined herein.

E6.2 A cash allowance has been included on Form B: Prices.

E6.3 The City reserves the right to delete any or all of the Cash Allowance from the Contract if the Work intended to be covered by the Cash Allowance is not required, or if the Works intended are found to be more extensive than the provisional Cash Allowance.

E6.4 Cost of additional work shall be evaluated by the methods outlined in C7.4, and a Change Order prepared by the Contract Administrator. Cost of the Change Order will be paid on the Progress Estimate and deducted from the Cash Allowance. If the valuation of the authorized work exceeds the Value of the Cash Allowance, the Contract Value will be adjusted by the shortfall.

E6.5 Additional services and/or Work will not be initiated for:

(a) Reasons of lack of performance or errors in execution.

(b) Scheduling changes initiated by the City, where at least 24 hours' notice is given prior to the Contractors schedule time to be on Site.

E6.6 Should it be determined that additional material or services are required, the Contract Administrator shall approve the Work, prior to commencement of the additional Work.

E6.7 Material Mark-Up Factors in accordance with C7:

(a) The base cost is to be the wholesale cost of the material, regardless of the Contractor or Subcontractor supplying the material.

(b) In general, the party (Contractor or Subcontractor) supplying the material is the party that purchases the material from a supplier who does not perform any work on Site, unless otherwise determined by the Contract Administrator.

(c) Where the Contractor is supplying the material, the mark-up on the material is limited to fifteen percent (15%).

(d) Where the Contractor's immediate Subcontractor is supplying the material the total mark-up on the material including all Subcontractors and the Contractor is limited to twenty-five percent (25%)

(i) The Subcontractor's mark-up on the material is limited to fifteen percent (15%);

(ii) The Contractor's mark-up on the material is limited to ten percent (10%).

(e) A Third-Level Subcontractor is a Subcontractor of a Subcontractor of the Contractor.

(i) No Third-Level Subcontractors on this project are approved for additional mark-up.

(ii) In the event that a Third-Level Subcontractor is utilized, that is not approved for additional mark-up, the Contractor is responsible for coordinating the split of the maximum approved mark-up between the Contractor and Subcontractors.

E7. TRAFFIC CONTROL AND MANAGEMENT

E7.1 Description

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

(b) CW 3410

E7.3 Scope of Work

E7.3.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130, the Work under this Specification shall include:

(a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW 3410.

(b) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for supplying, placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC, the Contract Drawings, Staging Plans, and Traffic Management Plans or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the supply, placement and maintenance of temporary traffic control devices by their own forces or subcontractor.

(c) In addition, the Contractor shall be responsible for removing, supplying, placing, and maintaining all regulatory signing including but not limited to:

(i) Parking restrictions,

(ii) Stopping restrictions,

(iii) Turn restrictions,

(iv) Diamond lane removal,

(v) Full or directional closures on a Regional Street,

(vi) Traffic routed across a median,

(vii) 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.

(d) The Contractor shall remove and stockpile any regulatory signage not required during construction such as but not limited to parking restrictions, turn restrictions and loading restrictions.

(e) Maintain a minimum of one lane of traffic at all times during construction, except the full closure at the bridge site shown on the Drawings.

(f) Intersecting local streets and private approach access shall be maintained at all times.

(g) Single lane closures on intersecting and/or adjoining Regional Streets shall only be permitted during non-peak periods when required for construction activities when approved by the Traffic Management Branch. Storage/parking of materials, equipment or vehicles is not permitted on Regional Streets at any time unless approved by the Contract Administrator, in consultation with the Traffic Management Branch.

(h) Traffic shall be maintained during clearing and grubbing works as indicated on Drawings 43 and 45.

(i) Flag persons may be necessary to maintain the flow of traffic during certain work operations.

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

(k) Pedestrian and cycling access must be maintained to the Bois-des-Esprits path, specifically, maintain access for path users between the path and Creek Bend Road.

(l) In the winter when the Seine River is frozen, a variety of pedestrian, cycling, skiing, snowshoeing, and other similar traffic may be present on the Seine River, desiring to pass through the construction site. Contractor shall provide and maintain temporary fencing, barricades and signage to direct and safely detour such river users around

the construction area, to the satisfaction of the Contract Administrator. Contractor shall not permit users of the frozen river surface to travel through the construction site.

(m) Contractor shall return the Seine River to an unobstructed and navigable condition for paddlecraft by Critical Stage D25.1(b) and such condition shall be maintained for the duration of the Summer Phase of construction.

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

E7.3.2 Further to E7.3.1(c) the Contractor shall supply regulatory signs as required.

E7.3.3 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

E7.3.4 Further to E7.3.1(c) and E7.3.1(d) the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the contract work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.

E7.3.5 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.

E7.3.6 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this specification, Traffic Services may be engaged to perform the Traffic Control and the Contractor shall bear the costs associated by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E7.4 Materials

E7.4.1 General

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

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

E7.5 Equipment

E7.5.1 General

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

E7.6 Construction Methods

E7.6.1 The Contractor shall advise the Contract Administrator five (5) days in advance of any new or change in lane closure.

E7.6.2 Erect and maintain all applicable traffic control devices (including, but not limited to, warning signs, barrels, tall cones and chevrons) as specified by MTTC, the Traffic Management Branch, the Contract Administrator.

E7.6.3 The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the MTTC and shall, at all times, ensure that maximum protection is afforded to the road-user and that their operations in no way interfere with the safe operation of traffic, cyclists or pedestrians.

E7.6.4 Improper signing will be sufficient reason for the Contract Administrator to order the Works to cease on Site.

E7.6.5 During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present a hazard to motorists, cyclists or pedestrians.

E7.7 Measurement and Payment

E7.7.1 Traffic Control and Management will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E8. SHOP DRAWINGS

E8.1 Description

E8.1.1 This Specification provides instructions for the preparation and submission of Shop Drawings.

E8.1.2 This Specification shall revise, amend, and supplement the requirements of CW 1110.

E8.1.3 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.

E8.1.4 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.

E8.1.5 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.

E8.1.6 Shop Drawings are required for the following components:

(a) Precast prestressed concrete channel girders;

(b) Abutment precast wall panels;

(c) Bearings and associated steel;

(d) Miscellaneous metal;

(e) Aluminum barrier rail and posts;

(f) Aluminum bicycle/handrail rail and posts; and

(g) Supply and fabrication of reinforcing steel.

E8.2 Scope of Work

E8.2.1 Review Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

E8.2.2 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.

E8.2.3 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.

E8.2.4 Notify Contract Administrator, in writing at time of shop drawing submission, of deviations from requirements of Contract Documents.

E8.2.5 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.

E8.2.6 Responsibility for errors and omissions in the shop drawing submission is not relieved by the Contract Administrator's review of the submittals.

E8.2.7 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.

E8.2.8 After the Contract Administrator has reviewed and returned the copies, distribute the copies to sub-trades as appropriate.

E8.2.9 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.

E8.3 Submittals

E8.3.1 Schedule submittals at least fourteen (14) Calendar Days before dates reviewed submittals will be needed, and allow for a fourteen (14) Calendar Days period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract.

E8.3.2 Submit five (5) paper prints or one (1) electronic PDF of Shop Drawings. The Contractor is advised that for paper copies, the Contract Administrator will retain three (3) copies of all submittals and return two (2) copies to the Contractor.

E8.3.3 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.

E8.3.4 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.

E8.3.5 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.

E8.3.6 Shop Drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

(a) Temporary Shoring;

(b) All Form Details, as requested by the Contract Administrator;

(c) Form Details for Deck Pours;

(d) Bearing Layout and Details;

(e) Metal Fabrications, Layout, and Erection Details for Miscellaneous Metal;

(f) Fabrication, Layout, and Erection Details for Precast Prestressed Concrete Channel Girders;

(g) Fabrication, Layout, and Erection Details for Abutment Precast Concrete Panels;

(h) Reinforcing Steel Layout and Details;

(i) Railings;

(j) Miscellaneous Metals.

E8.4 Equipment

E8.4.1 General

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

E8.5 Other Considerations

E8.5.1 Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

E8.5.2 Material and equipment delivered to the Site will not be paid for until pertinent Shop Drawings have been submitted and reviewed.

E8.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

E8.5.4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions, and review of Shop Drawings.

E8.5.5 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.

E8.6 Measurement and Payment

E8.6.1 Shop Drawings shall be considered incidental to the Work and no separate measurement or payment will be made.

E9. VERIFICATION OF WEIGHTS

E9.1 Description

E9.1.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

(a) All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

(b) The tare weight and net weight may either be handwritten or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

(i) checking Contractor's scales for Consumer & Corporate Affairs certification seals;

(ii) observing weighing procedures;

(iii) random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale;

(iv) checking tare weights shown on delivery tickets against a current tare.

(c) No charge shall be made to the City for any delays or loss of production caused by such inspection and verification.

E9.1.2 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.

E9.1.3 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

(a) upon which scale the truck or truck/trailer(s) combination was weighed;

(b) the mechanically printed tare weight;

(c) the license number(s) of the truck and trailer(s);

(d) the time and date of weighing.

E9.1.4 Further to clause 3.16.3 of CW 1130 no charge shall be made to the City for any delays or loss of production caused by inspection and verification.

E10. PROTECTION OF EXISTING TREES

E10.1 Description

E10.1.1 This Specification shall cover all operations relating to the protection of existing trees.

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 Work as hereinafter specified.

E10.2 Scope of Work

E10.2.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing trees within the limits of the construction area:

(a) The Contractor will field-verify the presumed limits of work indicated on the Drawings and flag all trees that require pruning or removal to facilitate the work, subject to the Contract Administrator's approval. Above ground clearance for overhanging branches in the work zone must be anticipated. No trees may be removed or pruned without written approval from the Contract Administrator. Forestry Branch will conduct an appraisal of affected trees concurrently with the Contract Administrator's review.

(b) Trees within or adjacent to a construction area that are not approved for removal by the Contract Administrator must be protected during construction by means of a barrier surrounding the TPZ as outlined in E10.2.4. Activities that are likely to injure or destroy the tree are not permitted within the TPZ.

(c) Tree pruning or root pruning of City of Winnipeg owned trees may only be done by a Contractor approved by the project's Qualified Tree Consultant (refer to E10.2.7) or Urban Forestry Branch.

(d) No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.

(e) No City of Winnipeg tree or tree protected by a City of Winnipeg by-law may be removed without the written permission of the City of Winnipeg.

(f) Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Contact the Forestry Branch for consultation on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.

(g) American elm trees are not to be pruned between April 1 and August 1 and Siberian elm trees between April 1 and July 1 of any year under provisions of The Dutch Elm Disease Act.

E10.2.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist licence or by the Forestry Branch.

E10.2.3 The Contractor will remove and replace any trees deemed to have died or that are dying due to damage from carelessness during construction. Removal and replacement costs will be determined by size, market price of the largest transplantable tree of same or different species and may include appraised value of existing tree as determined by current International Society of Arboriculture evaluation procedure presently used by Forestry Branch in conjunction with City Claims Branch. For reference, the estimated replacement cost of a 600 mm diameter American elm on a boulevard based on this appraisal system is approximately $27,000.00.

E10.2.4 Tree Protection Zone

(a) The following is a chart showing optimal distances for determining a tree protection zone (the roots of a tree can extend from the trunk to approximately two (2) to three (3) times the distance of the drip line). Some site conditions may dictate the need for a smaller TPZ. The City of Winnipeg Urban Forestry Branch must be notified in these instances. Forestry will determine if the smaller TPZ is acceptable in the specific circumstance and advise of any additional tree protection or removal requirements.

Table E10-1: Tree Protection Zones

Trunk Diameter (DBH)	**Minimum Protection Distances Required**
<10 cm	2.0 m
11-40 cm	2.4 m
41-50 cm	3.0 m
51-60 cm	3.6 m
61-70 cm	4.2 m
71-80 cm	4.8 m
81-90 cm	5.4 m
91-100 cm+	6.0 m

(b) Diameter at breast height (DBH) measurement of tree trunk is taken at 1.4 m above ground.

(c) Tree Protection Zone distances are to be measured from the outside edge of the tree base towards the drip line and may be limited by an existing paved surface, provided the existing paved surface remains intact throughout the construction work.

E10.2.5 Tree Protection Barriers

(a) Trees within tree protection zones shall be protected by means of a “tree protection barrier” meeting the following Specifications:

(i) the required barrier is a 1.2 m high orange plastic web snow fencing on 50 mm x 100 mm frame or as directed by the City of Winnipeg Urban Forestry Branch in accordance with the City of Winnipeg Protection of Existing Tree Specifications. The barrier can be lowered around branches lower than 1.2 m. The barrier location can be adjusted to align with curbs and edges at clear path of travel zones.

(ii) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 mm x 100 mm x 2400 mm wood planks, or suitably protected as approved by the Contract Administrator.

(iii) Tree protection barriers are to be erected prior to the commencement of any construction or grading activities on the site and are to remain in place throughout the entire duration of the project. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place;

(iv) All supports and bracing used to safely secure the barrier should be located outside the TPZ. All supports and bracing should minimize damage to roots. No grade change, storage of materials or equipment is permitted within this area. The tree protection barrier must not be removed without the written authorization of the City of Winnipeg;

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

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

E10.2.6 Utility Construction, Engineering, and Capital Construction Projects

(a) It is recognized that there are cases where trees are growing overtop existing utilities or beside capital infrastructure. While the guidelines in this section still apply, in these cases some modification to Table E10 - 1 in addition to root pruning may be permitted provided non- open trench methods of construction are employed (as defined in CW 2110 and CW 2130).

(b) Root Pruning will be required to be done under the direction of, and along with, written sign-off by the Project’s Qualified Tree Consultant (Refer to E10.2.7). The objective is to avoid severance of anchor roots, which provide upright support for trees and minimize damage to the tree.

(c) Above ground clearance for overhanging branches in the work zone must be anticipated. The utility or its consultant is required to have a Forestry approved tree service raise the crown of all branches to provide adequate clearance for construction equipment.

E10.2.7 Qualified Tree Consultants

(a) An arborist certified by the International Society of Arboriculture (ISA) who has a diploma (minimum) in arboriculture or with a Manitoba Arborist license.

(b) A landscape architect who is a member in good standing of the Manitoba Association of Landscape Architects.

E10.3 Equipment

E10.3.1 General

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

E10.4 Measurement and Payment

E10.4.1 Protection of Existing Trees will be considered incidental to the Work. No separate measurement or payment will be made for the protection of trees.

E11. WATER OBTAINED FROM THE CITY

E11.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E12. SURFACE RESTORATIONS

E12.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E12.2 Where the Contractor chooses to perform any part of the Work that impacts the existing surface conditions for pedestrian, bicycle and vehicle passage, without promptly completing the final surface works required in Contract, the Contractor shall construct temporary surface restorations meeting the requirements of 3.3 of CW 1130 and to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary surface restorations in a safe condition until the final surface works are completed by the Contractor according to Contract. The Contractor shall bear all costs associated with temporary surface restorations and their maintenance.

STRUCTURAL WORKS

E13. CREEK BANK EXCAVATION

E13.1 Description

E13.1.1 This Specification shall cover all operations related to the excavation of material for the Creek Bend Bridge Works and surface excavation near the Seine River including removal of topsoil and vegetation, and shall amend and supplement CW 3170.

E13.1.2 The Contractor shall coordinate creek bank excavation activities with creek flow maintenance, bridge demolition and removals and slope stabilization works, as there is specific sequencing of works that must take place in order to maintain stability of the embankment slopes. Coordinate activities in accordance with E16 “Bridge Demolition and Removals”.

E13.1.3 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 Works as herein specified and as indicated on the Drawings.

E13.2 References

E13.2.1 The latest edition and subsequent revisions of the following:

(a) CW 2030 – Excavation Bedding and Backfill;

(b) CW 2130 – Gravity Sewers;

(c) CW 2160 – Concrete Underground Structures and Works;

(d) CW 3110 – Sub-Grade, Sub-Base and Base Course Construction;

(e) CW 3130 – Supply and Installation of Geotextile Fabrics; and

(f) CW 3615 – Rip Rap.

E13.3 Scope of Work

E13.3.1 The Work under this Specification shall involve:

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

(b) The design, fabrication and erection of all temporary shoring and such temporary protective measures as may be required to construct the Works;

(c) Clearing and grubbing operations in areas where excavation is required;

(d) Excavating topsoil where excavation is required;

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

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

(g) Complying with the requirements outlined in D19, “Environmental Protection Plan”.

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.

E13.5 Materials

E13.5.1 General

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

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

E13.5.2 Testing

(a) All excavated materials 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.

E13.5.3 Excavation

(a) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of any and all materials that may be encountered.

(b) Suitable clean clay fill material shall be used for areas requiring fill.

E13.6 Equipment

E13.6.1 General

E13.6.2 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 Excavation – Alterations to Site

(a) The Contractor shall excavate only material that is necessary for the expeditious construction of the Works or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of runways, existing stock piling, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at their own expense and as directed by the Contract Administrator.

E13.7.2 Protection of Existing Embankment Slopes

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

E13.7.3 Excess Material

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

E13.7.4 Excavating Creek Bank Material

(a) Prior to commencing any excavation Works, underground clearances shall be obtained from all applicable utilities by the Contractor. Due care and caution shall be taken by the Contractor to work around all identified underground utilities.

(b) Excavations shall be completed to the elevations required to construct the Works, to the lines and grades as shown on the Drawings, or to such other elevations as may be directed by the Contract Administrator in the field.

(c) In general creek bank excavation shall consist of removing existing material to facilitate removal of the existing culvert and construction of the new culvert, channel excavation to provide the new channel profile and slopes and hydraulic opening, and thickened rip rap and excavation required for installation of rip rap.

(d) Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

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

(f) Double handling of excavated material may be required due to the depth of excavation and height of the bank, and material should be transferred up the slope in an expeditious manner. No temporary material piles may remain on the slope for longer than one hour during the transferring process. The Contractor should pace the excavation to keep up with the removal from Site.

(g) Areas for stockpiling of materials shall be proposed by the Contractor for approval by the Contract Administrator. No stockpiling shall be permitted without prior approval by the Contract Administrator.

E13.7.5 Clearing and Grubbing

(a) Removal of brush and other vegetation may be required to facilitate the Works. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation, and dispose of the material off site.

E13.7.6 Excavating Topsoil

(a) Removal of vegetation and topsoil may be required to facilitate the Works. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation, and dispose of the material off site.

(b) Stripping of topsoil shall not be measured or paid for directly, but shall be considered incidental to construction of the Works.

E13.7.7 Off-Site Disposing of Surplus and Unsuitable Material

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

(b) Stockpiling will not be permitted.

E13.7.8 Protection of Existing Embankment Slopes

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

E13.7.9 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the Site to prevent sediment releases into the waterway from areas disturbed as a result of their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D19, “Environmental Protection Plan”. Specific sediment and erosion control measures are outlined in E14, “Silt Fence Barrier” and E15, “Erosion Control Blanket (ECB)”.

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

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

(d) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E13.8 Quality Control and Assurance

E13.8.1 Quality Control

(a) After each excavation is completed, the Contractor shall notify the Contract Administrator to inspect the excavation.

(b) 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.

(c) 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.

(d) 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 Creek Bank Excavation

(a) Creek Bank Excavation shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Excavation", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E14. SILT FENCE BARRIER

E14.1 Description

E14.1.1 This Specification shall cover all operations relating to the work necessary for the supply, installation, and maintenance of silt fence barrier, as herein specified.

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 Works as hereinafter specified.

E14.2 References

E14.2.1 The latest edition and subsequent revisions of the following:

(a) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3);

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

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

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

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

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

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

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

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

E14.3 Scope of Work

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

(b) Supplying and installing temporary silt fence barrier;

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

(d) Removing silt fence barrier and restoring the area where the fencing was installed, without further disturbing the area and without releasing any deleterious substances to the adjacent watercourse;

(e) Complying with all requirements outlined in D19, “Environmental Protection Plan”.

E14.4 Submittals

E14.4.1 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.

E14.4.2 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.

E14.5 Materials

E14.5.1 General

(a) All materials supplied under this Specification shall be of a type approved by the

(b) Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.

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

E14.5.2 Handling and Storage of Materials

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

E14.5.3 Fence Posts

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

E14.5.4 Filter Fabric

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

Table E14-1: Filter Fabric Requirements

Property	Test Method	Value
Grab Tensile Strength	ASTM D4632	0.55 kN
Grab Tensile Elongation	ASTM D4632	15%
Mullen Burst	ASTM D3786	2060 kPa
Puncture	ASTM D4833	0.285 kN
Trapezoid Tear	ASTM D4533	0.285 kN
UV Resistance	ASTM D4355	80% @ 500 hrs
Apparent Opening Size (AOS)	ASTM D4751	0.60 mm
Flow Rate	ASTM D4491	405 l/min/m^2

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

E14.5.5 Wire Mesh

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

E14.5.6 Fencing Material Fasteners

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

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.

E14.7 Construction Methods

E14.7.1 General

(a) Silt fencing which should be installed at the start of the work, shall be installed along areas where there is stripped or exposed soil where run-off would enter the River. Final locations of the silt fence barrier will be dependent upon site conditions and the Contractor's activities and methods, and may require adjustment.

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

(c) Work shall be undertaken in accordance with D19, "Environmental Protection Plan" to prevent deleterious substances from entering into the River during construction.

E14.7.2 Silt Fence Barrier Installation

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

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

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

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

E14.7.3 Silt Fence Barrier Maintenance

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

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

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

E14.7.4 Silt Fence Barrier Removal

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

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

E14.7.5 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into the River from areas disturbed as a result of their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D19, “Environmental Protection Plan”.

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.

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.

E14.8.3 Measurement and Payment

E14.8.4 Silt Fence Barrier

(a) Supplying, installing, maintaining, and removing silt fence barrier will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “Supply and Install Silt Fence Barrier”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(b) Payment for silt fence barrier shall be based on the following breakdown:

(i) Following supply and installation: Sixty percent (60%)

(ii) Following final removal: Forty percent (40%)

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

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

E15. EROSION CONTROL BLANKET (ECB)

E15.1 Description

E15.1.1 This Specification shall cover the supply, installation, and maintenance of Erosion Control Blanket (ECB), as herein specified.

E15.1.2 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.

E15.2 References

E15.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revisions:

(a) ASTM D1117 – Standard Guide for Evaluating Nonwoven Fabrics;

(b) ASTM D1388 – Standard Test Method for Stiffness of Fabrics;

(c) ASTM D6525 – Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products;

(d) ASTM 6818 – Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products;

(e) Erosion Control Technology Council (ECTC) Guidelines.

(f) Specification E14, Silt Fence Barrier.

E15.3 Scope of Work

E15.3.1 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) Supplying and installing erosion control blanket on disturbed slopes of the river banks above riprap limits associated with Structural Works.

(b) Supplying and temporarily installing erosion control blanket to protect disturbed slopes where sodding and permanent vegetation/restoration is eventually to take place associated with Landscaping.

(c) Complying with all requirements outlined in D19, “Environmental Protection Plan”.

E15.4 Submittals

E15.4.1 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.

E15.4.2 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.

E15.5 Materials

E15.5.1 General

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

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

E15.5.2 Handling and Storage of Materials

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

E15.5.3 Erosion Control Blanket

(a) Erosion Control Blanket shall be a machine-produced mat of seventy percent (70%) agricultural straw and thirty percent (30%) coconut blanket with a functional longevity of up to twenty-four (24) months. Suitable products include SC 150 Extended Term manufactured by North American Green, or approved equivalent in accordance with B7“Substitutes”.

(b) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat.

(c) The blanket shall be covered on the topside with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 159 mm x 159 mm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 127 mm x 127 mm mesh. The blanket shall be sewn together on 381 mm centres (maximum) with degradable thread.

(d) Erosion Control Blanket shall have the following properties:

(i) Matrix seventy percent (70%) Straw Fibre (0.19kg/m2) and thirty percent (30%) Coconut Fibre (0.08kg/ m2);

(ii) Netting top side heavyweight photodegradable with UV additives (1.47 kg/100 m2);

(iii) Bottom side lightweight photodegradable minimum netting weight (0.73 kg/100m2); and

(iv) Degradable thread.

(e) Staples used to secure Erosion Control Blanket shall be as recommended by the Manufacturer.

E15.6 Equipment

E15.6.1 General

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

E15.7 Construction Methods

E15.7.1 General

(a) Erosion Control Blanket shall be placed on all disturbed and exposed slopes for which

(b) revegetation is required.

(c) The Contractor shall coordinate silt fencing activities with the referenced Specifications noted in E14.

(d) Locations of Erosion Control Blanket will be confirmed on site with the Contract Administrator.

E15.7.2 Erosion Control Blanket Installation

(a) The Erosion Control Blanket shall be rolled out in the direction of the water flow.

(b) The upper edges of the blanket on the side slopes and the edges at the terminal ends of the installation shall be placed in a 150 mm x 150 mm trench.

(c) The upper edges shall be stapled at 1000 mm intervals and the terminal edges shall be stapled at 300 mm intervals within the trench. The trench shall be then be

backfilled and compacted. The side and end seams shall be overlapped edge over edge (shingle style) with an overlap of 150 mm. The side seams shall be stapled at 1000 mm intervals and the end seams shall be stapled at 300 mm intervals.

(d) At 10 m intervals, the Contractor shall place a double row of staggered staples to secure the blankets. The staples shall be spaced 100 mm apart. The remainder of the blanket shall be stapled at a rate of four (4) staples per m2. The blanket may have to be trimmed to size to conform to the area to be covered.

(e) Transverse joints and end seams in the Erosion Control Blanket shall have a minimum overlap of 150 mm and secured with 200 mm staples a maximum of 300 mm apart.

(f) Should the Contract Administrator determine that the Contractor has not installed the Erosion Control Blanket properly or has damaged the blankets from construction activities resulting in sediment releases beyond the Work area; the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at their own cost. As a minimum, the Contractor shall remove all deltas and sediment deposited in drainage ways and re-grade the areas where sediment removal results in exposed soil. The removal and restoration shall take place within five (5) working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within five (5) working days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration Work to restore property outside of the designated Work area shall be at their own cost.

E15.7.3 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Seine River from areas disturbed as a result of their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D19, “Environmental Protection Plan”.

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

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

(d) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E15.8 Quality Control and Assurance

E15.8.1 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.

E15.8.2 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.

E15.9 Measurement and Payment

E15.9.1 Erosion Control Blanket

(a) Supplying and installing erosion control blanket associated with Structural Works will not be measured. Supplying and installing erosion control associated with Structural Works will be paid for at the Contract Lump Sum Price for "Supply and Install Erosion Control Blanket", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E16. BRIDGE DEMOLITION AND REMOVALS

E16.1 Description

E16.1.1 Description

(a) This Specification shall cover all operations related to the demolition and removal of the entire existing bridge and previous structural elements as herein specified and as shown on the Drawings.

(b) The Work to be done by the Contractor under this Specification shall include the furnishings 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 herein specified and as indicated on the Drawings.

(c) Scope of Work

(i) The Work under this Specification shall involve the following:

I. Removal of all existing components of the existing bridge and previous structural elements;

II. All material from the demolished bridge shall be removed from Site by the Contractor in accordance with the Contractor's Environmental Protection Plan; and

III. Excavation or any other works to facilitate the removals and demolition of the existing bridge and previous structural elements.

E16.2 Referenced Specifications and Drawings

E16.2.1 The latest edition and subsequent revisions of the following:

(a) City of Winnipeg By-Law No. 92/2010 Part 7 – Discharges of Wastewater, and

(b) CW 3550 – Chain Link and Drift Control Fence.

E16.3 Materials

E16.3.1 General

(a) The Contractor shall be responsible for design and construction works related to the demolition and removal of the existing bridge and is subject to the approval of the Contract Administrator.

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

E16.4 Submittals

E16.4.1 The Contractor shall prepare a demolition and removals plan. The plan shall include the design and drawings, Sealed by an Engineer Registered in the Province of Manitoba, the sequence and methods to be used to demolish and remove the existing culvert. The demolition plan shall be in strict accordance with the Regulatory Approvals and the Environmental Protection Plan.

E16.4.2 The demolition and removals plan shall indicate the sequence, machinery, methods and proposed access to accomplish the demolition of the existing bridge.

E16.4.3 The demolition plan shall be submitted a minimum of 10 days prior to the commencement of demolition.

E16.5 Equipment

E16.5.1 General

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

E16.6 Construction Methods

E16.6.1 General

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

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

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

(d) The Contractor close shall not commence any construction operations until such time as all signage and barricades have been installed to the satisfaction of the Contract Administrator.

(e) Traffic and pedestrian control shall conform to the requirements of E7 “Traffic Control and Management”.

(f) Remove concrete and other removal items with appropriate equipment satisfactory to the Contract Administrator. No demolition products are to find their way into the watercourse. The Contractor shall take all necessary precautions to ensure that material does not fall onto any open roadways or sidewalks during removal operations.

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

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

(i) Dispose of all surplus and unsuitable material off site, in accordance with D19 "Environmental Protection Plan".

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

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

(l) 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 form the Contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the Site.

E16.6.2 Details of Existing Structure

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

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

E16.6.3 Existing Utilities

(a) There are existing buried and overhead utilities in the vicinity of the project work. The Contractor shall contact utility providers prior to commencing construction operations to locate utilities.

(b) The Contractor is responsible for determining the existence, location and elevation of all utilities and/or structures and is responsible for notifying the appropriate company, department, or person(s) of its intention to carry out its operation.

(c) The Contractor shall contact all utilities prior to the start of work to arrange for clearances and line locations as construction within the markings provided must be carried out in accordance with the instructions of the affected utilities. The Contractor shall be responsible for the cost of repair to any damage and for any claims due to loss of service caused by construction operations. No compensation will be paid to the Contractor for any delays due to work by utility companies.

(d) The following utilities have been identified within the limits of Work:

(i) Manitoba Hydro street lights;

(ii) Manitoba Hydro gas line on the east side of Creek Bend Road;

(iii) Manitoba Hydro overhead power on the west side of Creek Bend Road;

(iv) BellMTS overhead on the east side of Creek Bend Road;

E16.6.4 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the Site to prevent sediment releases into the creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D19 "Environmental Protection Plan". Specific sediment and erosion control measures are outlined in E14 "Silt Fence Barrier" and E15 "Erosion Control Blanket (ECB)".

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

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

(d) Disturbed areas shall be restored. ECB, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

(e) Contractor is advised that the timber components of the existing bridge contain creosote preservative. Contractor shall comply with applicable regulations for the handling and disposal of creosote treated components.

E16.7 Measurement and Payment

E16.7.1 Bridge Demolition and Removals

(a) Bridge demolition and removals will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “Bridge Demolition and Removals”, 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.

E17. STRUCTURAL EXCAVATION

E17.1 Description

E17.1.1 This Specification covers all operations relating to the following:

(a) Excavation required to construct the Creek Bend Bridge Works.

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) CW 3110 – Subgrade, Sub-Base, and Base Course Construction;

(b) CW 3170 – Earthwork and Grading; and

(c) Specification E10, Protection of Existing Trees.

E17.3 Scope of Work

E17.3.1 The Works under this specification shall include the following items, which are incidental to the Work.

(a) Excavation works.

(b) Preparation of the base of excavations.

(c) The design, fabrication, erection, and removal of all temporary shoring, and such temporary protective measures as may be required to construct the Works.

(d) The proper off-site disposal of surplus or unsuitable material.

(e) Dewatering and/or precipitation removal of the excavations as may be required for construction of the works in the dry.

E17.4 Submittals

E17.4.1 The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Calendar Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E17.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Calendar Days prior to the commencement of any scheduled Work on the Site the following:

(a) Detailed design calculations and Shop Drawings for all shoring that is signed, sealed, and dated by a Professional Engineer experienced in shoring design and licensed to practice in the Province of Manitoba in accordance with E8.

(b) The Professional Engineer who designed the temporary shoring system shall inspect the temporary shoring system during construction, and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.

E17.5 Materials

E17.5.1 General

(a) Protection

(i) The Contractor shall ensure no damage to existing facilities and equipment and provide protection if required. The facilities include, but are not limited to:

I. Manitoba Hydro overhead line to the west of the structure.

II. Manitoba Hydro has line to the east structure.

III. Bell MTS overhead line to the east of the structure.

IV. Manitoba Hydro street lights.

V. City of Winnipeg Watermain and LDS south of the structure.

(b) Excavation

(i) 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 workmanship-like manner, to the satisfaction of the Contract Administrator.

(ii) All excavated materials and 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.

(iii) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, earth, gravel, asphalt, concrete pavement, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, augured material for the vertical drains, abandoned utilities, existing timber or other culverts and structures, or all other material of whatever character which may be encountered.

E17.6 Equipment

E17.6.1 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 Excavation

(a) Excavations shall be completed to the elevations required to construct the Works or to such other elevations as may be directed by the Contract Administrator in the field. Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of the excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

(b) All material shall be brought to the surface by approved method, suitable fill material placed on site where required as approved by the Contract Administrator or disposed of away from the site.

(c) After each excavation is completed, the Contractor shall notify the Contract Administrator.

(d) The Contractor shall excavate only material that is necessary for the expeditious construction of the structure or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of existing stock piles, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at their own expense and as directed by the Contract Administrator.

(e) All excess excavated material shall become the property of the Contractor and shall be removed from the site.

(f) During construction the Contractor may be required to dewater excavations.

(g) No measurement and payment of dewatering of excavation will be made and shall be considered incidental to the Work.

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.

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.

(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.

E17.9 Measurement and Payment

E17.9.1 Structural Excavation

(a) The structural excavation required for the Creek Bend Bridge Works not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for “Excavation”, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E18. STEEL BEARING PILES

E18.1 Description

E18.1.1 This Specification shall cover the supply and driving of steel bearing piles.

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, handling and storage, and all other things necessary for and incidental to the satisfactory performance and completion of all Work as herein specified and as indicated on the Drawings.

E18.2 Scope of Work

E18.2.1 The Work under this Specification shall involve:

(a) Supplying and driving steel H piles for the Creek Bend Bridge piers and abutments.

E18.3 Referenced Specifications

E18.3.1 The latest edition and all subsequent revisions to the following Standards:

(a) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(b) CSA W59 – Welded Steel Construction (Metal Arc Welding); and

(c) AASHTO/AWS D1.5m / D1.5 Bridge Welding Code.

E18.4 Submittals

E18.4.1 General

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

E18.4.2 Steel Mill Certificates

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement Work on site, the steel mill certificates.

E18.4.3 Pile Driving System

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, details of the proposed pile driving system and Manufacturer's specifications and catalogue for all mechanical hammers used, showing the data necessary for computing the bearing value of the pile driven.

E18.4.4 Welding Certification

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, proof of qualification for the Contractor and the welders conducting the Work (if applicable).

(i) The Contractor shall produce evidence that all welding operators to be employed on the Work are currently qualified by the C.W.B. in the processes in which they are to be employed on the Work.

(ii) The Contractor shall produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six month period previous to the award of this Contract.

E18.4.5 Welding Procedures

(a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, the welding procedures specific to the Work (if applicable). The procedures shall include

the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment.

(b) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, Shop Drawings for pile tip and cutting shoe installations.

E18.5 Materials

E18.5.1 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Piling shall be handled, hauled, and stored in a manner that avoids damage to piles and all associated piling material.

(b) The Contractor shall not be permitted to drag piles along the ground.

(c) Any piles excessively damaged through negligence or improper handling operations shall be immediately removed from the site and replaced with sound piles. This shall be done at the Contractor's own expense.

E18.5.2 Steel "H" Piles

(a) Steel "H" piles shall be structural HP 250X85 and HP 310x110 steel members, as specified on the Contract Drawings, and conforming to CSA G40.21, Grade 350W or ASTM A572 Grade 50.

(b) Pile driving points shall be Point No. HPP-S-12, by Titus Steel Co. Ltd., Mississauga, Ontario, or Pruyn HP75750, by Associated Pile and Fitting Corporation, Clifton, NJ, USA or an approved equal at the discretion of the Contract Administrator.

(c) All welding shall conform to CSA Standard W59, electric arc method.

(d) Splices shall not be permitted for piles.

E18.6 Equipment

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

(b) Pile driving system to be used by the Contractor shall be of such a capacity that the required bearing and pile penetration shall be obtained without damaging the piles.

(c) The pile driving hammer used to install steel H piles shall be capable of delivering a minimum energy of 230 J per square-centimetre of pile cross-sectional area (33 kJ for an HP310x100 or 25 kJ for an HP250x85) to the pile head, with the ability to reliably operate at different energy levels (i.e. different fuel settings, variable strokes, variable ram weight, etc.). The amount of energy delivered to the pile head may need to be increased to reach refusal and to prevent pile damage.

(d) Pile driver leads shall be used to support the piles while they are being driven.

(e) The heads of steel bearing piles shall be cut squarely if required and protected by a pile cap. The pile cap shall be designed to hold the axis of the pile in line with the axis of the hammer. The top of the cap shall have a timber or polyethylene shock block (ie. capblock or hammer cushion).

E18.7 Construction Methods

E18.7.1 Preconstruction Meeting

(a) Prior to pile driving a preconstruction meeting with the Contractor, Piling Subcontractor, Geotechnical Engineer, and Contract Administrator shall be held to review the Pile Driving submission and review the proposed pile driving system, sequence of work, refusal requirements, and energy settings.

E18.7.2 Geotechnical Report

(a) The geotechnical report is attached in Appendix A. Borehole logs are also provided on the Drawings.

E18.7.3 Location and Alignment of Piles

(a) The piles shall be located to the positions shown on the Drawings. Pile lengths on Drawings have been calculated based on estimated tip elevation and pile cut-off elevations. The Contractor shall be responsible for reviewing all boring logs and geotechnical information for the verification of required supply pile lengths to support their driving equipment and operations.

(b) Piles shall not be jacked or pulled into their final positions.

E18.7.4 Installing Pile Tips

(a) All pile driving points shall be welded by the Contractor prior to commencement of pile driving operations.

(b) Material to be welded shall be preheated in accordance with CSA W59.

E18.7.5 Pile Refusal Requirements

(a) HP 310x110 piles shall be driven to practical refusal into the bedrock layer, except for the icebreaker piles which are driven to length as shown on the Contract Drawings.

(b) HP 250x85 piles shall be driven to length as shown on the Contract Drawings.

(c) Refusal criteria for all piles shall be considered to be three consecutive sets of ten (10) to fifteen (15) blows per 25mm of pile penetration, provided that a well maintained hammer capable of delivering the required energy to the pile head per blow is utilized. Final refusal criteria will be confirmed by the Contract Administrator following submission of the items noted in E18.4, and following driving of the first pile to refusal.

E18.7.6 Driving of Piles

(a) Pile driving equipment shall be operated from existing grade.

(b) The piles shall be driven to the positions shown on the Drawings. Piles shall not deviate more than two (2) percent for battered piles, nor more than two (2) percent out-of-plumb for vertical piles. Piles shall not be more than 75 mm off centre, measured at time of cut off.

(c) The method of driving shall be such as not to impair the strength of the pile. All piles shall be driven to refusal as end bearing piles. The Contractor will be required to remove any surface and/or shallow depth obstruction(s) to obtain the required penetration of the pile.

(d) Piles shall be driven in the most practicable manner to ensure that the piles at the boundaries are in their correct final positions.

(e) Driving stresses shall not exceed 90% of the yield stress of the steel.

(f) All piles shall be re-driven for one set of the refusal criteria a minimum of twenty-four (24) hours following installation of all piles for a given abutment or pier. If relaxation of any pile is observed upon re-driving, all piles shall be re-driven to a minimum of one set of the specified refusal criteria on a daily basis until no further relaxation of piles is observed.

(g) Upon re-driving a pile, all adjacent piles exhibiting heave of 6mm or more should be re-driven to a minimum of one set of the refusal criteria.

(h) Driving of all piles shall be continuous without intermission until the pile has been driven to final elevation.

(i) Where boulders or other obstructions make it difficult to drive certain piles in the location shown and to the proper bearing strata or depth, the Contractor shall resort to all usual methods to install piles as required.

(j) Any piles that are excessively crushed or bent through negligence or carelessness the Contractor shall be removed or otherwise replaced, unless, in the opinion of the

Contract Administrator, the damage is so slight that the pile can be repaired properly, which repairs shall be done by this Contractor.

(k) Pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane, to be used for securely and accurately support the pile in its required position during driving. Leads shall be of sufficient length to be supported firmly on the ground. The use of hanging or swinging leads will not be allowed unless they can be held in a fixed position during the driving operations. Battered piles shall be driven with inclined leads.

(l) For pile installation monitoring purposes, the Contractor shall paint markings on each pile at 0.25 metre intervals, with a label at each 1.0 metre interval, starting from the toe of the pile.

(m) Pre-boring of piles is not permitted, unless approved by the Contract Administrator.

(n) For practical refusal of piles, the final set shall be determined by three consecutive readings meeting the set criteria identified by the Contract Administrator. Final set will be measured and recorded in blows per 25mm by the Contract Administrator. Refer also to E18.7.5 regarding refusal requirements.

E18.7.7 Splicing of Piles

(a) Splicing of piles driven to length will not be permitted, unless approved by the Contract Administrator. If splices are required, at the Contract Administrator's direction, the Contractor shall be reimbursed for the cost of providing a splice as specified in C7.4(d).

(b) Splicing of piles driven to refusal shall not have more than one splice per pile unless otherwise approved by the Contract Administrator and shall be installed in accordance with the Drawings. The location of the splice shall be approved by the Contract Administrator.

(c) Material to be welded shall be preheated in accordance with CSA W59.

E18.7.8 Cut-Off of Piles

(a) After piles have been driven to the required penetration and re-driven, the Contractor shall mark the required cut-off elevation on each pile. The top of all piles shall be neatly cut off (true and level) at the cut-off elevation specified on the Drawings.

E18.8 Quality Control and Assurance

E18.8.1 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.

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. 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) Pile Driving Records:

(i) The Contract Administrator will keep a record of each and every pile driven. The records shall give the driving date, installation time, pile type, size, length, location, final penetration depth, rate of penetration (i.e. number of blows per 250mm of pile penetration), final three sets meeting refusal criteria, hammer type and fuel setting (drop height). Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.

(ii) Energy output of driving equipment at the time of final set shall be reported immediately to the Contract Administrator. The required set per blow will be subject to acceptance by the Contract Administrator, showing regard to the specific driving equipment and piles permitted.

E18.9 Measurement and Payment

E18.9.1 Steel H Piles

(a) Supplying of steel H piles shall be measured per lineal metre of steel piling supplied as measured by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for “Supply Steel H Piles”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(b) Driving of steel H piles shall be measured per linear metre of driven steel piling. The length to be paid for shall be the total number of lineal metres of piling shown on the Drawings or authorized by the Contract Administrator, less fifty (50) percent of the total number of lineal metres of piling cut off after driving as measured in the field by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for “Drive Steel H Piles”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(c) Supplying of steel H pile driving tips shall be measured on a unit basis and paid for at the Contract Unit Price per unit for “Supply Pile Driving Tips”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(d) Installation of steel H pile driving tips shall be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of Pile Driving Tips”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(e) Splicing of steel H piles shall be measured on a unit basis and paid for at the Contract Unit Price per unit for “Pile Splices”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(f) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Supply Steel H Piles”, unless otherwise noted herein. No

separate measurement or payment shall be made for this Work unless indicated otherwise.

E19. STRUCTURAL BACKFILL

E19.1 Description

E19.1.1 This Specification covers all operations relating to the following:

(a) Creek Bend Bridge Works.

E19.1.2 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.

E19.2 References

E19.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Standard Construction Specification CW 2030-R7

(b) Test Method ASTM D2487 – Classification of Soils for Engineering Purposes

E19.3 Scope of Work

E19.3.1 The Work under this Specification shall include the following items, which are incidental to the Work:

(a) Placement and compacting of fill, including granular base for the approach slabs, slope paving and drainage troughs, and wildlife bench.

(b) Supply and installation of polyethylene sheeting and NuDrain DN50-1 or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes” and shown on Drawing B149-23-35.

(c) Supply and installation of polystyrene at the abutment channel locations as shown on Drawing B149-23-35.

(d) The proper off-site disposal of surplus or unsuitable material.

E19.4 Materials

E19.4.1 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.

(c) Protection

(i) The Contractor shall provide protection to ensure no damage to existing facilities, equipment, and utilities.

(d) Backfilling

(i) 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.

(ii) All materials shall be accepted 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 Specification 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 their own expense.

(iii) Backfill materials shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Backfill shall not be placed on frozen subsoil.

(iv) All granular backfill for the Creek Bend Bridge Works shall be clean and free from organic material and in accordance with CW 2030-R7.

(v) All granular backfill for the Creek Bend Bridge Works shall be Material in accordance with CW 3110-R22 Granular B gradation requirements:

(vi) Non-granular cohesive material shall be highly plastic clay (exhibiting putty-like properties with considerable strength when dry) and non-organic. Material with very high swelling potential such as bentonite clay will not be permitted. When proposed material characteristics are in question, the Contract Administrator may require the Contractor to classify the material using Test Method ASTM D2487 – Classification of Soils for Engineering Purposes. Non-granular cohesive material shall have a minimum Plasticity Index of 40. The non-granular cohesive material shall be free of rocks and stones.

(vii) Excavated material may be used for backfilling provided it meets the above requirements. Excavated granular material intended to be used for backfilling must not be contaminated by topsoil or organic materials.

(e) Sheet Drain

(i) NuDrain DN50-1 or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes”.

E19.5 Equipment

E19.5.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E19.6 Construction Methods

E19.6.1 General

(a) The Contract Administrator shall be notified at least one (1) working day in advance of any backfilling operations. No backfill shall be placed against any concrete until accepted by the Contract Administrator.

(b) All backfill material shall be supplied, placed, and compacted in lifts of 150 mm (maximum) to a minimum of one-hundred percent (100%) of Standard Proctor Dry Density, except for an area within 1.5m from the back face of the walls and girders shall be compacted to ninety-two (92%) of Standard Proctor Dry Density. Lifts shall be brought up on all sides at the same time.

(c) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

(d) The Standard Proctor Density for granular and clay backfill material shall be determined at the optimum moisture content in accordance with standard laboratory Proctor Compaction Test Procedure.

(e) The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard, Test for Density of Soil in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.

(f) The frequency and number of tests to be made shall be as determined by the Contract Administrator.

(g) All workmanship and 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 previously been given. The Contract Administrator reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification.

(h) The Contract Administrator shall be allowed free access for the inspection and control testing of constituent materials both at the site of the Work and at any plant used for production of the materials to determine whether the material is being supplied and placed in accordance with this Specification.

(i) Any backfill material that does not meet the gradation and/or compaction requirements of this Specification shall be removed and replaced by the Contractor at their own expense, to the satisfaction of the Contract Administrator.

E19.7 Quality Control and Assurance

E19.7.1 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.

E19.8 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.

E19.9 Measurement and Payment

E19.9.1 Structural Backfill

(a) The backfill required for the Creek Bend Bridge Works will not be measured. Structural Backfill shall be paid for at the Contract Lump Sum Price for “Structural Backfill”, which price will be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E20. CELLULAR CONCRETE BACKFILL

E20.1 Description

E20.1.1 This Specification shall cover the supply and installation of cellular concrete backfill, as specified herein and as shown on the Drawings.

E20.1.2 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 or incidental to the satisfactory performance and completion of all Work as herein specified and as indicated on the Drawings.

E20.2 References

E20.2.1 CAN/CSA A3001, Cementitious Materials for Use in Concrete

E20.2.2 CSA A23.1, Concrete Materials and Methods of Concrete Construction

E20.2.3 ASTM C869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

E20.2.4 ASTM C796, Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam

E20.2.5 ASTM C495-99a, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

E20.3 Qualification

E20.3.1 The Contractor is to submit the qualifications of the Subcontractor that is to produce and place the cellular concrete for review and approval by the Contract Administrator.

E20.3.2 The approved Subcontractor producing and placing cellular concrete shall have a record of experience and quality of work that is satisfactory to the Contract Administrator, and shall be capable of developing a mix design, batching, mixing, handling, and placing cellular concrete. The Subcontractor shall be certified by the manufacturer of the foaming agent and regularly engaged in the production and placement of cellular concrete. The Subcontractor shall have an adequate number of fully qualified workers who are thoroughly trained and experienced in the production and placement of cellular concrete.

E20.4 Equipment

E20.4.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E20.4.2 The specialized batching, mixing, and placing equipment shall be automated and certified for the purpose by the manufacturer of the cellular concrete material. Dry-mix equipment must be able to receive bulk cement and produce over 100 cubic metres per hour on Site, continuously, from one piece of equipment, and pump through hoses or pipes up to a flat lineal distance of 1000 metres. Bulk cement shall be weighed on a scale that operates within a tolerance of one and one-half percent (1.5%) per batch. Wet-mix equipment must be able to receive slurry on Site into the equipment and process it continuously during ready-mix supply, and pump through hoses or pipes up to a flat lineal distance of 200 metres.

E20.4.3 Cellular concrete must be pumped by a positive displacement pump (Peristaltic or similar). A foam generator shall be used to continuously produce pre-formed foam, which shall be injected and mixed with the cementitious slurry downstream of the positive displacement slurry pump. The equipment shall be calibrated to produce a precise and predictable volumetric rate of foam with stable uniform microbubbles.

E20.5 Materials and Testing

E20.5.1 Cellular concrete shall be CEMATRIX CMEF-400 lightweight engineered fill, or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes”, with the following properties:

(a) Minimum unconfined compressive strength at 28 days of 0.3 MPa.

(b) Wet cast density of 400 kg/m3 (+/-10%)

E20.5.2 Portland cement shall conform to the requirements of CSA Standard CAN/CSA A3001, Type GU or HE. Supplementary cementing materials shall conform to the requirements of CSA Standard CAN/CSA A3001.

E20.5.3 Mixing water shall conform to the requirements of CSA Standard A23.1. Water of questionable quality shall not be used unless proven to produce specimens whose 28-day compressive strength is at least 90% of those made with known acceptable water and an identical material mix.

E20.5.4 Foaming agents shall conform to the requirements of ASTM C869 when tested in accordance with the provisions of ASTM C796. CEMATRIX CF-1 or PROVOTON foaming agents shall be used, or equal as accepted by the Contract Administrator, in accordance with B7 “Substitutes”. The Subcontractor shall be pre-qualified and approved in writing by the foaming agent manufacturer, referencing this Project. A copy of the written approval is to be submitted to the Contract Administrator prior to the commencement of the work.

E20.5.5 The fresh cellular concrete density shall be measured and recorded once per production run, or once for every 50 cubic metres, or once per 30 minutes, whichever is more frequent. The density shall be maintained within +/- 10% of the design density.

E20.5.6 Cellular concrete samples must be captured, cured, and tested to verify the compressive strength requirement is satisfied. One sample is comprised of one set of six cellular concrete cylinders. One sample should be taken for each placement, or every 100 m3, whichever is more frequent. Cylinders are cast in 75mm by 150mm cylindrical plastic molds. The sample mold must be lined with “freezer paper” with the plastic side against the cellular concrete. Cellular concrete cylinders shall be cured and tested as per ASTM C495-99a, modified to represent the field curing conditions for geotechnical applications.

E20.6 Subgrade Conditions and Site Preparation

E20.6.1 The subgrade shall be cleared of vegetation, soft, wet, muddy, loose soil and other deleterious material, and graded and compacted to the lines and grades shown on the relevant drawings. The prepared subgrade shall be good competent level ground with nominal compaction to provide a firm base. The placement area shall be free of standing water during placement of cellular concrete and until backfill is placed on top of the cellular concrete. Snow and ice must be removed from the area prior to placement.

E20.7 Installation

E20.7.1 Any items to be fully or partially encased in the cellular concrete shall be properly set and stable prior to the installation of the cellular concrete.

E20.7.2 Where required, formwork should be designed and installed to withhold cellular concrete, and may require lining with poly sheeting or similar impermeable membrane to prevent leakage. The sheet drain system on the side of the steel sheet piles shall also be lined with poly sheeting.

E20.7.3 Cellular concrete may be placed during freezing conditions, provided measures are taken to prevent damage to the cellular concrete until sufficient strength has been attained. Care should be taken to avoid freezing before initial set. Cellular concrete must not be placed during heavy or prolonged precipitation.

E20.7.4 Once mixed, the cellular concrete shall be conveyed promptly to the location of placement without excessive handling.

E20.7.5 The Contractor shall determine the maximum lift thickness based on density and any other considerations that may impact placement. Cellular concrete shall be cast in a formed area within 1 to 2 hours, to permit an undisturbed setting.

E20.7.6 Finished surface elevation shall be with +/- 25mm of the design grades shown on the Drawings. Cellular Concrete can be placed with a maximum slope of 1%. Slopes greater than 1% will require profiling by creating steps for the Cellular Concrete with formwork.

E20.7.7 Loading of, or traffic on, the cellular concrete shall be prevented until the material has attained sufficient strength to withstand the loads with no damage. Backfill can commence with cellular concrete supports foot traffic without leaving an indentation.

E20.8 Quality Control and Assurance

E20.8.1 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.

E20.8.2 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.

E20.9 Measurement and Payment

E20.9.1 Cellular Concrete

(a) Cellular concrete shall be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Supply and Place Cellular Concrete” 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, accepted and measured by the Contract Administrator.

E21. SUPPLY, FABRICATION, AND ERECTION OF MISCELLANEOUS METAL

E21.1 Description

E21.1.1 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.

E21.1.2 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.

E21.2 References

E21.2.1 References and Related Specifications:

(a) All related Specifications shall be current issued or latest revision at the first date of tender advertisement;

(b) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel;

(c) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding;

(d) CSA W59, Welded Steel Construction (Metal Arc Welding);

(e) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles;

(f) CSA W47.1, Certification of Companies for Fusion Welding of Steel;

(g) ASTM A36, Standard Specification for Carbon Structural Steel;

(h) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless;

(i) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished;

(j) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products;

(k) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes;

(l) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service;

(m) ASTM F3125, High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength;

(n) ASTM A404, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings;

(o) ASTM A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use;

(p) ASTM A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement;

(q) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

(r) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding;

(s) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service;

(t) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered;

(u) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement;

(v) ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar;

(w) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables;

(x) ASTM B29, Standard Specification for Refined Lead;

(y) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use;

(z) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay);

(aa) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code;

(bb) AWS D1.1, Structural Welding Code – Steel;

(cc) AWS D1.6, Structural Welding Code – Stainless Steel;

(dd) ANSI A250.8, Specifications for Standard Steel Doors and Frames (SDI-100);

(ee) ANSI A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames;

(ff) ANSI A250.4,Test Procedure and Acceptance Criteria for – Physical Endurance for Steel Doors, Frames and Frame Anchors.

E21.3 Scope of Work

E21.3.1 The Work under this Specification shall include:

(a) Ice Breaker Attachment

(b) Pier Pile Bents

(c) Abutment Pile Bents

(d) Pier Bracing

E21.4 Submittals

E21.4.1 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 as specified in E8 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.

E21.5 Materials

E21.5.1 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.

E21.5.2 General Requirements for Miscellaneous Metals

(a) Miscellaneous metals shall conform to CSA G40.21 Grade 300W 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.

E21.5.3 Miscellaneous Metals

(a) Structural steel for all components of the miscellaneous metals shall be in accordance with CSA standard G40.21M, to grade CSA G40.21 Grade 300W. 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 monotubular shafts and arms, and to less than three tenths of a percent (0.3%) for all other steel components.

E21.5.4 Steel plates and threaded roads

(a) Shall be supplied and installed by the Contractor as shown on the Drawings.

E21.5.5 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.

E21.5.6 High Strength Bolts, Nuts, and Washers

(a) High strength bolts, nuts, and hardened washers shall be in accordance with ASTM F3125/F3125M Grade A325/A325M, A563/A563M, and F436/F436M. The nuts, bolts, and washers shall be shipped together as an assembly.

(b) Bolts, nuts, and washers used with steel specified on the Drawings or in this Specification to be painted or to be metallized, shall be Type 1.

(c) Galvanized fastener nuts shall be over-tapped by the minimum amount required for assembly and shall be lubricated with a lubricant containing a visible dye.

E21.5.7 Shear 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.

E21.5.8 Welding Consumables

(a) The selection, supply, and storage of electrodes for SMAW and fluxes for SAW shall be according to CAN/CSA W59 requirements. Only controlled hydrogen designation electrodes and low hydrogen wire consumables shall be used for the SMAW and flux-

cored arc welding processes, respectively. Electrodes and fluxes shall be strictly stored and maintained as required by CAN/CSA W59, section 5.2.

(b) The weld filler metal in fracture critical and primary tension members shall meet the Charpy V notch impact energy requirements of Table E20.7.

(c) Weld metal used with corrosion resistant steels shall have similar corrosion resistance and colour to the base metal and shall be supplied according to CAN/CSA W59.

E21.5.9 Replacement of Damaged Materials

(a) All material supplied by the Fabricator that in the opinion of the Contract Administrator has been damaged or otherwise rendered unusable by improper storage or handling by the Contractor shall be replaced by the Contractor at his expense.

E21.6 Equipment

E21.6.1 General

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

E21.7 Construction Methods

E21.7.1 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) Hot-Dip Galvanizing

(i) Galvanizing, when called for on the Drawings, shall be done in accordance with CAN/CSA G164.

(ii) All metal surfaces to be galvanized shall be cleaned thoroughly of rust, rust scale, mill scale, dirt, paint and other foreign material by commercial sand, grit or shop blasting or pickling prior to galvanizing. Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling.

(iii) Metal to be galvanized includes:

I. Abutment pile bents and associated connection hardware;

II. Pier pile bents and associated connection hardware;

III. Bearing keeper bars;

IV. Girder retaining plates; and

V. Embedded girder hardware.

(iv) Metal not to be galvanized includes:

I. Piles;

II. Icebreaker attachment; and

III. Pier bracing.

(c) 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.

(d) 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.

(e) 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.

(f) Welding

(i) Specifications

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

(ii) Welding Operator Qualification

I. Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. 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.

(g) 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.

(h) 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.

(i) 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.

(j) 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.

Welding Process

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.

(k) 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.

(l) 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.

(m) 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.

(n) Hot-Dip Galvanizing

(i) Galvanizing, when called for on the Drawings, shall be done in accordance with ASTM A123 and CSA G164;

(o) 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.

(p) Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling to SSPC – SP 1.

E21.7.2 Material Preparation

(a) Straightening Material

(i) All steel shall be flat and straight according to the specified mill tolerances before commencement of fabrication. Material with sharp kinks or bends shall only be straightened with the approval of the Contract Administrator. The Contractor shall submit written procedures for approval to the Contract Administrator and shall not commence straightening work until he has received permission from the Contract Administrator.

(ii) When straightening is approved, material may be straightened using mechanical means or by the application of controlled heating according to CAN/CSA W59.

(iii) Details of the method of straightening shall be according to CAN/CSA W59 and submitted to the Contract Administrator two (2) weeks prior to the Contractor arranging for inspection of the straightened material and non-destructive testing.

(iv) The Contract Administrator shall be given one (1) week notice to arrange for their inspections.

(b) Edge Preparation

(i) Sheared edges of plates with a 16 mm thickness or greater and that carry calculated tension shall have 3 mm of edge material removed by planing, milling or grinding.

(ii) Oxygen cutting of structural steel shall be done by machine except hand-guided cutting will be allowed for copes, blocks and similar cuts where machine cutting is impractical. Re-entrant corners shall be ground smooth and shall have a fillet of the largest practical radius, but in no case shall the radius be less than 25 mm.

(iii) Plasma arc cutting shall only be done when approved in writing by the Contract Administrator. All nitrogen plasma arc cut edges shall be ground back by 0.5 mm when welding will be carried out on these edges.

(iv) The quality of the cut edges and their repair shall be according to CAN/CSA W59. All cut edges that are not to be welded shall have a surface roughness not greater than 1000 as defined by CAN/CSA B95. Edges of all flanges shall be rounded to a 1.5 mm radius by grinding. In addition all edges of all members and plates exposed to view or weather in the finished assembly shall be rounded to a 1.5 mm radius by grinding.

(v) All steel edges that will be painted whether resulting from rolling, cutting or, shearing operations shall be rounded to a 1.5 mm radius by grinding prior to blast cleaning.

(vi) The Brinell hardness of the edges of flanges plates for fracture critical or primary tension members shall not exceed 220. If the measured hardness exceeds 220, the edges shall be ground to remove the harder layer or annealed by means of a preheating torch.

(c) Direction of Rolling

(i) Steel plate for main members shall be cut so that the primary direction of rolling is parallel to the direction of tensile or compressive stress.

(d) Bolt Holes

(i) Hole Size

I. The nominal diameter of a hole other than oversize or slotted holes shall not be more than 2 mm greater than the nominal bolt size with the exception of the following bolt and hole combinations:

(a) either a 19 mm (3/4") or an M20 bolt in a 22 mm hole;

(b) either a 22 mm (7/8") or an M22 bolt in a 24 mm hole; and,

(c) either a 25 mm (1") bolt or an M24 bolt in a 27 mm hole.

II. Unless otherwise approved by the Contract Administrator, oversize or slotted holes shall only be used when specified on the Drawings or in the Specification. Non-specified oversize or slotted holes will only be considered for use in bracing and diaphragms.

III. Oversize holes when permitted shall not be more than 4 mm larger than the nominal bolt size for bolts 22 mm or less in diameter; 6 mm larger than the nominal bolt size for bolts between 23 and 26 mm in diameter; and 8 mm larger than the nominal bolt size for bolts 27 mm and greater in diameter.

(ii) Punched Holes

I. Holes shall only be punched to finish size in material 16 mm or less in thickness.

II. The diameter of a hole punched to finish size shall not be more than 2 mm larger than the nominal diameter of the bolt unless oversize holes are approved.

III. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. Holes shall be clean cut without ragged or torn edges. Sharp edges shall be ground smooth without reducing the cross-section

of the member. The slightly conical hole that results from this operation is acceptable.

(iii) Drilled Holes

I. Holes which are drilled to finished diameter shall be 2 mm larger than the nominal diameter of the bolt unless oversize or slotted holes have been specified. Holes to be drilled shall be accurately located by using suitable numerically-controlled drilling equipment, or by using a steel template carefully positioned and clamped to the steel. The dimensional accuracy of holes and locations prepared in this manner shall be such that like parts are exact duplicates and require no match marking.

II. The holes for any connection may be drilled to the required finished diameter when the connecting parts are assembled and clamped in position, in which case the parts shall be match-marked before disassembling.

III. Cover plate holes shall be field drilled in place. Cover plate to be securely fastened to the girder prior to drilling. Bolt holes may be shifted slightly to avoid conflicts.

(iv) Reamed Holes

I. Holes which are to be reamed to the specified finished diameter shall first be sub-drilled or sub-punched to 4 mm less than the finished hole diameter. The holes shall be reamed to 2 mm larger than the nominal diameter of the bolts with connecting parts assembled and securely held in place during reaming. The connecting parts shall be match-marked before disassembling. Reamed holes shall be truly cylindrical and perpendicular to the member. All burrs shall be removed without reducing the cross section of the member.

(v) Tolerances

I. Center to Center – 12 m or less: +/- 1.0 mm

II. Center to Center – 12 to 18 m: +/- 1.5 mm

III. Center to Center – 18 to 24 m: +/- 2.5 mm

IV. Center to Center – over 24 m: +/- 3.0 mm

(vi) Pins and Rollers

I. Pins and rollers shall be accurately turned to the dimensions and finish shown on the Drawings and shall be straight and free from flaws. Pins and rollers more than 175 mm in diameter shall be forged and annealed. Pins and rollers 175 mm or less in diameter may be either forged and annealed or may be made from cold finished carbon-steel shaft.

II. Holes for pins shall be bored to the diameter and to the finish specified on the Drawings or in the Specification and at right angles to the axis of the member. The diameter of the pin hole shall not exceed that of the pin by more than

(a) 0.5 mm for pins 125 mm or less in diameter or by 0.75 mm for larger pins. Built up members shall be completely assembled prior to boring of pin holes.

(vii) Bent Plates

I. General

(a) Rolled steel plates to be bent shall be cut from the stock plates so that the bend line is at right angles to the direction of rolling except as otherwise approved for orthotropic decks.

(b) Before bending, the edges of the plate within the bend region shall be rounded to a 3 mm radius by grinding in the region of the bend.

II. Cold Bending

(a) Cold bending shall be carried out in such a manner that no cracking or tearing of the plate occurs. Minimum bend radii for various plate thicknesses (t), measured to the concave face of the metal shall be:

TABLE E21.1

t (mm)	Radius (mm)
t ≤ 12	2 t
12 ≤ t ≤ 25	2.5 t
25 ≤ t ≤ 38	3 t
38 ≤ t ≤ 65	3.5 t
65 ≤ t ≤ 100	4 t

III. Hot Bending

(a) Forming radii less than that permitted for cold bending shall be done by hot bending at a plate temperature not greater than 600°C. Accelerated cooling of a hot bent component will only be permitted when the temperature of the component is below 300°C. Only compressed air or water shall be used for accelerated cooling.

(viii) Faying Surfaces

I. All faying surfaces shall be cleaned by sand blasting in the shop for new components and in the field for existing steel components.

(ix) Marking

I. Each member shall carry a unique erection mark for identification.

II. Permanent marking shall be affixed in an area not exposed to view in the finished structure.

(x) Temporary Works

I. Temporary welds shall not be used on fracture-critical and primary tension members.

II. Temporary welds shall not be used on flange material in compression unless approved by the Contract Administrator.

E21.7.3 Bolted Construction

(a) General

(i) 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.

(b) Assembly

(i) 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.

(ii) 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.

(iii) The faying surfaces of connections identified as slip-critical connections shall be prepared as specified below.

I. For clean mill scale, the surfaces shall be free of oil, paint, lacquer, or any other coating and then blast cleaned.

II. For coated surfaces other than galvanized, the surfaces shall be free of oil, lacquer, or other deleterious coatings.

III. Hot dip galvanized surfaces shall be roughened after galvanizing by means of hand wire brushing. Power wire brushing is not permitted.

(iv) 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.

(c) Bolt Tension

(i) Pretensioned bolts shall be tightened to at least 70% of the specified minimum tensile strength given in the appropriate ASTM standard.

(d) Reuse of Bolts

(i) 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.

(e) Hardened Washers

(i) Hardened washers shall be provided under the head and the nut of each bolt for a total of two (2) washers per bolt.

(ii) Hardened washers are required under the nut and bolt head adjacent to joint surfaces containing oversize or slotted holes.

(f) Bevelled Washers

(i) 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.

(g) Turn-of-Nut Tightening

(i) 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.

(ii) 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.

(iii) 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 E21.2

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.

(h) Field Fit-up

(i) Connection holes into existing structural steel materials shall only be drilled in the field with the new structural steel firmly clamped in place.

(ii) Components shall be supported in a manner consistent with the final geometry of the bridge as specified in the Drawings.

(iii) Holes in the webs and flanges of main components shall be drilled to finished diameter while in assembly.

(i) Match Marking

(i) 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.

E21.7.4 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.

E21.7.5 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.

E21.8 Quality Control and Assurance

E21.8.1 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

I. All welding may be subject to inspection by Non-Destructive Testing. This inspection shall be carried out in a manner approved of the Contract Administrator.

(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.

E21.8.2 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.

E21.9 Measurement and Payment

E21.9.1 Miscellaneous Metal

(a) Supply, fabrication and erection of miscellaneous metal will be measured on a weight basis and will be paid for at the Contract Unit Price Per Kilogram for the "Items of Work" listed here 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.

(b) Items of Work:

Miscellaneous Metal:

(i) Ice Breaker Attachment

(ii) Pier Pile Bents

(iii) Abutment Pile Bents

(iv) Pier Bracing

E22. STRUCTURAL CONCRETE

E22.1 Description

E22.1.1 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.

E22.1.2 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.

E22.2 References

E22.2.1 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.

E22.3 Scope of Work

E22.3.1 The Work under this Specification shall include:

(a) Supplying and placing structural concrete for bridge deck slab, bridge traffic barriers, and sidewalk curbs;

(b) Supplying and placing structural concrete for structural sidewalks;

(c) Supplying and placing structural concrete for approach slabs; and

(d) Supplying and placing structural concrete for the approach slab traffic barriers and curbs.

E22.4 Submittals

E22.4.1 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.

E22.4.2 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 A23.1-04 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.

E22.4.3 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, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post- cracking residual strength index (Ri) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 16, Fibre Reinforced Structures, Clause 16.6.

(iii) Testing for post-cracking residual strength index (Ri) of FRC shall be tested as follows:

I. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure in accordance to ASTM C1609-10. The average of the peak loads is the cracking load of the concrete (Pcr).

II. A second set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure in accordance with ASTM C1399-04. The average of the peak loads during reloading is the post cracking load of the concrete (Ppcr).

III. The Ri is equal to the ratio of Ppcr over Pcr. The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Tests conducted in accordance to ASTM C1399-04 will be considered invalid by the Contract Administrator if the initial crack in the specimen has occurred after 0.5 mm deflection. Provide all load deflection curves with test submissions (initial and reloading curves).

(iv) 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.

E22.4.4 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.

E22.4.5 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 S269.3-M92. 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:

I. 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.

E22.4.6 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, 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.

E22.4.7 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.

E22.4.8 Screed for Deck Slab Concrete

E22.4.9 Plans for anchoring support rails shall be submitted to the Contract Administrator for review and acceptance at least fourteen (14) Days prior to the scheduled commencement of concrete placement. The Contract Administrator's written acceptance must be received by the Contractor prior to the installation of any anchorage devices.

E22.4.10 Concrete Deck Slab Pour Sequence and Schedule

(a) The Contractor shall pour the deck slab in and uphill direction. Should the Contractor opt to submit an alternate construction pour sequence for the deck slab concrete,

the Contractor shall submit the proposed alternate construction pour sequence to the Construction Administrator for review, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement.

(b) The Contractor shall submit to the Contract Administrator for review, at least fourteen (14) Days prior to the placement of concrete, details of the construction joints.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to scheduled commencement of concrete placement, the proposed concrete placement schedule for all other structural concrete placements of this Specification.

E22.5 Materials

E22.5.1 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.

E22.5.2 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.

E22.5.3 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.

E22.5.4 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-A23.1-04.

E22.5.5 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 E24-1.

TABLE E22-1

REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	Deck & Approach Slabs, Concrete Barriers,	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15

	Curbs						

E22.5.6 Working Base Concrete

(a) Working base concrete shall be placed in the locations as shown on the Drawings.

(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.

E22.5.7 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-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 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 A23.1-04, 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 A23.1-04, 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 A23.1-04, 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 A23.1-04, Table 12, for concrete exposed to freezing and thawing.

E22.5.8 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.

E22.5.9 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.

E22.5.10 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 A23.1-04 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.

E22.5.11 Synthetic Fibres

(a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polyolefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance to the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6 except the post-cracking residual strength index (Ri) shall be determined in accordance with ASTM C1609.

E22.5.12 Formwork

(a) Formwork materials shall conform to CSA Standard A23.1-04, and American Concrete Publication SP4, “Formwork for Concrete.”

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121- M1978, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved Manufacturers are “Evans” and “C-Z.”

(d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

(e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or stainless steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(i) Stay-in-place formwork or falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E22.5.13 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 B6.

E22.5.14 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) 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.

E22.5.15 Architectural Formwork Liner

(a) The Contractor shall supply and install the architectural concrete finish formwork liner for use at the location backside of the bridge traffic barriers and roadway traffic barriers as shown on the drawings in accordance with the Manufacturer's recommended procedures. Approved products are #154 (½" sine wave) by Scott Systems.

E22.5.16 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.

(b) Curing compound for approach slabs and slope paving shall be resin-based and white- pigmented.

(c) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B7.

E22.5.17 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 B6.

E22.5.18 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:

I. 1 part water;

II. 1 part latex bonding agent; and,

III. 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.

E22.5.19 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.

E22.5.20 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.

E22.5.21 Cementitious Grout

(a) Cementitous grout shall be nonshrink and non-metallic. 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.

E22.5.22 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.

E22.5.23 Flexible Joint Sealant

(a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non- staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with B6.

E22.5.24 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751-99 or equal as accepted by the Contract Administrator, in accordance with B7.

E22.5.25 EMSEAL Precompressed Foam Joint Filler

(a) Expansion joint seal shall be EMSEAL BEJS or equivalent as approved by the Contract Administrator to ASTM C711 and ASTM G155-00A.

(i) Sealant system shall be comprised of three components:

I. Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water- based emulsion, factory coated with highway-grade, fuel resistant silicone;

II. Field-applied epoxy adhesive primer; and,

III. Field-injected silicone sealant bands.

(ii) Impregnation agent to have proven non-migratory characteristics. Silicone coating to be highway-grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. Depth of seal as recommended by manufacturer. BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field- applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½" (12 mm) down from the substrate surface.

(iii) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plane and direction shall be executed using factory fabricated "Universal 90" transition assemblies. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.

(iv) All substitute candidates to be certified in writing to be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be certified in writing to be:

I. Capable of withstanding 65°C for three (3) hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of normal material size) without evidence of any bleeding of impregnation medium from the material; and,

II. That the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within twenty-four (24) hours at room temperature 20°C.

E22.5.26 Ethafoam Joint Filler

(a) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application and shall be the type accepted by the Contract Administrator in accordance with B7.

E22.5.27 Low Density Styrofoam

(a) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B7.

E22.5.28 Backup Rod

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

E22.5.29 Screed Bases and Chairs

(a) Screed bases shall be Hilti HAS 304 stainless steel threaded rods, or equal as accepted by the Contract Administrator, in accordance with B7.

(b) Screed chairs shall be Mega Screed as supplied by Brock White Canada Company, or equal as accepted by the Contract Administrator, in accordance with B7.

E22.5.30 Anchor Units for Aluminum Pedestrian Handrail/Bicycle Rail

(a) Anchor units for the aluminum pedestrian handrail/bicycle rail shall be stainless steel Acrow-Richmond Type DGRS-1.

E22.5.31 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.

(b) Benchmark Plugs

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

E22.6 Equipment

E22.6.1 General

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

E22.6.2 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.

E22.6.3 Placing and Finishing Equipment for Bridge Deck Concrete and Approach Slabs

(a) Placing Equipment

(i) Adjacent exposed reinforcing steel shall be adequately protected during concrete placement.

(b) Screed

(i) The Contractor shall use a mechanical screed to strike the surface of the superstructure concrete.

(ii) Screed rails are required and shall be sufficient in number and length to ensure that the concrete cover is maintained and the finished elevation of the deck slab concrete meets the design elevations.

(iii) Screed guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

(iv) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.

(v) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.

(vi) Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.

(vii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).

(viii) The supply, setup, operation, and takedown of the screed for deck slab concrete shall be considered incidental to the placement of the deck slab concrete. No separate measurement or payment shall be made for this Work.

E22.7 Construction Methods

E22.7.1 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.

E22.7.2 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.

(b) Form panels shall be constructed so that the contact edges are kept flush and aligned.

(c) Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.

(d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.

(e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.

(f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is

exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break- back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in matching colour of surrounding concrete.

(g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

(h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

(i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.

(j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the Site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

E22.7.3 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 E22.7.14, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E22.7.4 Bridge Deck Screeds

(a) Setting Deck Screeds

(i) The Contractor shall adjust screeds to maintain uniform slab thickness. Adjust screed

(ii) heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases will be permitted to be drilled and grouted into existing concrete and shall be adjustable to achieve the required elevations.

(iii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E22.7.5 Concrete Bridge Traffic Barrier Joints

(a) For the joint sealing at all locations, the Contractor shall submit shop drawings and his proposed installation procedures to the Contract Administrator for approval fourteen (14) days prior to installation.

(b) The installation of the fibre joint filler and the EMSEAL joint sealing shall be undertaken as shown on the drawings.

(c) EMSEAL joint seals shall not be field spliced except when specifically permitted by the Contract Administrator in writing.

(d) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting ends and securing in place by stapling or other positive fastening methods.

(e) The EMSEAL joint sealing at the barrier joints shall be installed as per the Manufacturer's recommendations.

(f) All joint sealing of Bridge traffic barriers shall take place prior to the installation of the Bituminous Paving.

(g) The supply and installation of EMSEAL joint sealing and fibre joint fillers shall be considered incidental to the Work, and no additional measurement or payment shall be made for this Work.

E22.7.6 Anchor Units for Bridge Traffic Barrier Posts, End Rail Units and Aluminum Pedestrian Handrail/Bicycle Rail

(a) All anchor units shall be as specified on the Drawings.

(b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.

E22.7.7 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.

E22.7.8 Architectural Formwork Liner

(a) Architectural formwork liner shall be used at locations shown on the drawings.

(b) The architectural formwork liner shall be replaced after each use unless specifically allowed to be reused by the Manufacturer, as approved by the Contract Administrator.

(c) The supply, setup, installation, and removal of architectural formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E22.7.9 Control Joint Seals

(a) Formed control joints sealant for all horizontal, vertical and sloping joints shall be applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended.

(b) Form control joints shall be thoroughly cleaned before sealing.

E22.7.10 Benchmarks

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

E22.7.11 Structure Identification Date

(a) The Contractor shall indent into the exposed concrete a structure identification date at such location at the west end of the structure as shown on the Drawings, in accordance with the detail shown on the Drawings, or as otherwise directed by the Contract Administrator.

E22.7.12 Approach Slabs Works

(a) The Contractor shall undertake the approach slab Works, as shown on the Drawings.

E22.7.13 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 A23.1-04, 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 E20.1, “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 A23.1-04 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 himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

(i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:

I. Limit the amount to be placed at any time (using adequate construction joints);

II. Augment his facilities and Plant in order to complete the proposed placement; and,

III. In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.

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

E22.7.14 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.

E22.7.15 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.

(ii) The Contractor is advised that closure of the south pedestrian underpass is only permitted once the Canoe Club golf course is closed for the golf season.

(b) Dry Run for Deck Slab Screed Machine

(i) The Contractor shall conduct a dry run of the screed machine in the presence of the Contract Administrator to verify that the screed supporting rails are properly set to ensure compliance with the specified longitudinal and transverse deck grades. Sufficient screed supporting guide rails to provide the required coverage for the entire pour, as approved by the Contract Administrator, shall be set out and adjusted for height at least one (1) Working Day prior to the proposed pour. The Contract Administrator will verify that the screed machine and screed rails have been adjusted so that the height of the screed above the existing concrete at each point meets the requirements. To confirm the Contractor's adjustments of the machine and screed rails, the screed machine shall be "dry run", and screed clearance measurements taken at each support point by the Contractor. Resetting of the machine and/or screed rails shall be done by the Contractor as required by the Contract Administrator.

(c) Placing Structural Concrete

(i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.

(ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.

(iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.

(iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.

(v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.

(vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.

(vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or “cold joints” within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.

(ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

(x) 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.

(xi) 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.

(xii) 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.

(xiii) 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.

(xiv) Before any concrete is placed for the approach slabs, or Bridge deck slab, the Contractor shall demonstrate to the satisfaction of the Contract Administrator before each pour that all necessary adjustments have been made to provide the required camber, crown, slab thickness, and concrete cover. This demonstration may be carried out by means of an attachment securely fastened to the finisher's strike-off machine and moving the machine and the strike-off across the deck over the reinforcing steel with a minimum 3 mm clearance between the steel and attachment.

E22.7.16 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 shall be patched as specified in this Specification.

(e) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

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

E22.7.17 General Curing Requirements

(a) Refer to E22.7.20 for cold weather curing requirements and E22.7.21 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.

E22.7.18 Form Removal

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.

(b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.

(c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for deck extensions shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super- imposed construction loads. Bridge deck overhang forms shall be loosened before forms are constructed and concrete is placed for bridge traffic barriers. Stripping of these forms shall not be permitted until a concrete strength of 28 MPa has been achieved by the deck slab concrete and the concrete bridge traffic barriers.

(d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E22.7.19 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.

E22.7.20 Cold Weather Concreting

(a) The requirements of CSA Standard A23.1-04 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.

E22.7.21 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 E26.2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

TABLE E22.2: ACCEPTABLE CONCRETE TEMPERATURES		
THICKNESS OF SECTION	**TEMPERATURE °C**	
	MINIMUM	**MAXIMUM**
Less than: 1.0 m 1.2 m	 10 5	 27 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.

E22.8 Quality Control and Assurance

E22.8.1 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 A23.1-04. 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.

E22.8.2 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

I. 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.

II. 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.

III. Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

(ii) Access

I. 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

I. 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.

II. All materials shall conform to CSA Standard A23.1-04.

III. All testing of materials shall conform to CSA Standard A23.2-04.

IV. All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

(e) Concrete Testing

(i) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-04, "Slump of Concrete". If the measured slump falls outside the limits in E23.5 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-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E23.5 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-04, 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) Testing for post-cracking residual strength index of FRC shall be conducted at the Contractor's expense as follows: one set of five concrete beam specimens, 100 mm by 100 mm b 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399-04 without the steel plate. The average of the peak loads is the cracking load of the concrete (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). Specimens shall be sampled in accordance with E20.69.7. Testing shall include the specified number of specimens from abutment concrete, pedestrian underpass concrete, traffic barrier concrete, and deck slab concrete for a total of four (4) complete tests. The Contractor shall promptly submit a summary of the test results to the Contract Administrator upon the conclusion of each test.

(vi) Testing for post-cracking residual strength index of FRC shall be tested as follows. One set of five concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested to failure using the same test set up in ASTM C 1399-04 without the steel plate. The average of the peak loads is the cracking load of the concrete (Pcr), and shall be provided to the Contract Administrator. A second set of five concrete beam specimens shall be tested to failure in accordance with ASTM C 1399-04. The average of the peak loads is the post cracking load of the concrete (Ppcr). The Contractor shall submit a summary of the results of all post-cracking residual strength index tests. Specimens shall be sampled in accordance with E20.69.8.

(vii) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".

(viii) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-04, "Making and Curing Concrete Compression and Flexure Test Specimens".

(ix) 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-04, "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.

(x) 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 E20.1 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-04, "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.

E22.9 Measurement and Payment

E22.9.1 Supplying and placing structural concrete will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the “Items of Work” listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(a) Items of Work:

Supply and Place Structural Concrete:

I. Type 1

(b) 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.

E23. SUPPLYING AND PLACING REINFORCING STEEL

E23.1 Description

E23.1.1 This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing and stainless steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

E23.1.2 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.

E23.2 References

E23.2.1 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.

E23.3 Scope of Work

E23.3.1 The Scope of Work under this Specification shall involve the supplying and installing of all reinforcing, as shown on the Drawings.

E23.4 Submittals

E23.4.1 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) The Contractor shall submit to the Contract Administrator for review, at least fourteen (14) Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.

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

(e) Contractor to submit Quality Control Testing Program to the Contract Administrator in accordance with E23.9.2.

(f) Contractor to submit Shop Drawings (including bar lists) in accordance with section E8 and the latest edition of the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

E23.5 Materials

E23.5.1 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.

E23.5.2 Handling and Storage of Stainless Steel Reinforcing

(a) Stainless steel reinforcing shall be store separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

(b) Chains for steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Wood or approved alternate should be used to protect the bars

(c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.

(d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

E23.5.3 Reinforcing Steel

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

(b) All reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.

(c) Stainless steel, as shown on the Drawings, shall be a high-manganese, low-nickel, nitrogen-strengthened austenitic stainless steel. Stainless steel reinforcing shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E23.1, "Type of Stainless Steel Reinforcing". Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

(d) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.

(e) All reinforcing steel shall be straight and free from paint, oil, 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-M92 and ASTM A955M.

TABLE E23.1
TYPE OF STAINLESS STEEL REINFORCING

Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205	Duplex 2205	S31803
Type 2304	EnduraMet 2304	S32304

E23.5.4 Bar Accessories

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

(b) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.

(c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

(d) Placing of bar supports shall be done to meet the required construction loads.

(e) Tie wire shall be the following:

(i) Black, soft-annealed 1.6 mm diameter wire or Nylon coated wire for black steel reinforcing; and,

(ii) Stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.

(f) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or 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 (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E23.5.5 Mechanical Splices

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

E23.6 Equipment

E23.6.1 General

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

E23.7 Construction Methods

E23.7.1 Fabrication of Reinforcing Steel

(a) General

(i) Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18-M92 to the lengths and shapes as shown on the Drawings.

E23.7.2 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.

(b) Stainless Steel Reinforcing

(i) Heating shall not be used as an aid in bending stainless steel reinforcing.

(ii) Hooks and bends should be smooth and not sharp.

(iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.

(iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel wire brushes only.

(v) All hand tools shall be stainless tools that have not been used on carbon steel.

E23.7.3 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 E23.5.4, “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.

E23.8 Splicing

E23.8.1 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.

E23.8.2 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.

E23.9 Quality Control and Assurance

E23.9.1 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.

E23.9.2 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 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.

(d) 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.

(e) Quality control testing may be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

E23.10 Measurement and Payment

E24.10.1 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 Reinforcing Steel
  (i) Black Steel Reinforcing
  (ii) Stainless Steel Reinforcing

(b) Placing Reinforcing Steel
  (i) Black Steel Reinforcing
  (ii) Stainless Steel Reinforcing

E23.10.2 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.

E24. RIP RAP

E24.1 Description

E24.1.1 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. This Specification also applies to grouted riprap pads.

E24.1.2 This Specification shall amend and supplement Specification No. CW 3615.

E24.1.3 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.

E24.2 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

(ii) CW 3130-R4 for “Separation Geotextile Fabric”.

E24.3 Submittals

E24.3.1 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.

E24.3.2 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.

E24.4 Materials

E24.4.1 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:

Gradation Requirements for Rip-rap

Diameter (mm)	Percent Passing by dry Weight
350	100%
300	75%
200	25%
5	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.

E24.4.2 Geotextile

(a) The geotextile shall be non-woven type, and supplied and placed in accordance with CW 3130-R4 for “Separation Geotextile Fabric”.

E24.5 Equipment

E24.5.1 General

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

E24.6 Construction Methods

E24.6.1 The bed for riprap shall be shaped and trimmed to the lines as shown on the Drawings or as staked in the field by the Contract Administrator, prior to placing of any riprap. No riprap shall be placed until the bed has been inspected and approved by the Contract Administrator.

E24.6.2 Place a layer of geotextile fabric under the riprap. Anchor the geotextile fabric on the upstream and downstream end of the rock filled trenches as shown on the Drawings.

E24.6.3 Place the rock riprap carefully on the geotextile fabric so that it does not tear. Place 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 hand work shall be done to procure a neat and uniform surface with the thickness as shown on the Drawings.

E24.7 Quality Control and Assurance

E24.7.1 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.

E24.7.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, 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.

E24.8 Measurement and Payment

E24.8.1 Riprap

(a) Riprap measurement and payment will be in accordance with CW3615.

(b) This work shall include all necessary trimming and excavation and the removal off site, of the excess excavated material, unless otherwise specified in the Specifications for the Work.

E24.8.2 Sub-excavation and disposal of excavated soil, shaping the riprap bed, supplying, loading, hauling, placing geotextile and stone riprap shall be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E25. PRECAST CONCRETE PANELS

E25.1 Description

E25.1.1 This Specification shall cover all operations relating to the supply and installation of the precast concrete panels as specified herein and as shown on the Drawings.

E25.1.2 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.

E25.2 References

(a) All reference standards and related specifications shall be current issue or latest revision at the date of tender advertisement.

(b) Specifications

(i) CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete

(ii) CAN/CSA A3001, Cementitious Materials for Use in Concrete

(iii) CAN/CSA G30.18, Billet-Steel Bars for Concrete Reinforcement

(iv) AASHTO T 176, Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test Nineteenth Edition

(v) ASTM C 29, Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate

(vi) ASTM C 40, Standard Test Method for Organic Impurities in Fine Aggregates for Concrete

(vii) ASTM C 42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

(viii) ASTM C 70, Standard Test Method for Surface Moisture in Fine Aggregate

(ix) ASTM C 88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate orb Magnesium Sulfate

(x) ASTM C 117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

(xi) ASTM C 127, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

(xii) ASTM C 128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

(xiii) ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

(xiv) ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

(xv) ASTM C 138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

(xvi) ASTM C 142, Standard Test Method for Clay Lumps and Friable Particles in Aggregates

(xvii) ASTM C 260, Standard Specification for Air-Entraining Admixtures for Concrete

(xviii) ASTM C 289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

(xix) ASTM C 295, Standard Guide for Petrographic Examination of Aggregates for Concrete

(xx) ASTM C 457, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete

(xxi) ASTM C 494, Standard Specification for Chemical Admixtures for Concrete

(xxii) ASTM C 535, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

(xxiii) ASTM C 586, Standard Test Method for Potential Alkali Reactivity of Carbonate Rocks as Concrete Aggregates (Rock-Cylinder Method)

(xxiv) ASTM C 1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

(xxv) ASTM C 1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

(xxvi) ASTM C 1084, Standard Test Method for Portland-Cement Content of Hardened Hydraulic-Cement Concrete

(xxvii) ASTM C 1202, Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

(xxviii) ASTM C 1567, Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

(xxix) ASTM C 1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)

(xxx) ASTM C 1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

(xxxi) ASTM D 75, Standard Practice for Sampling Aggregates

(xxxii) ASTM D 4791, Standard Test Method for Flat Particles, Elongated Particles or Flat and Elongated Particles in Coarse Aggregate

(xxxiii) ASTM D 5821, Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

(xxxiv) ASTM D 6928, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

(xxxv) ASTM D 7428, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

E25.3 Scope of Work

E25.3.1 The Work under this Specification shall involve:

(a) Supplying and installing abutment precast concrete panels; and

(b) Supplying and installing all miscellaneous items and other items associated with the Work.

E25.4 Submittals

E25.4.1 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.

E25.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the precast concrete panels. Fabrication shall take place as shown on the Drawings.

E25.4.3 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, concrete mix design statement sealed by a Professional Engineer licensed in the Province of Manitoba that meets the minimum compressive strength of 35 MPa at 28 days. The mix design shall contain:

(a) Concrete mix design proportions.

(b) Type of cementitious materials used and source locations.

(c) Designated size of aggregates, and aggregate gradations.

(d) Aggregate source locations.

(e) Maximum water/cement ratio.

(f) The design slump.

(g) The limits for air content.

(h) Type and brand of admixtures.

(i) Certification that all concrete constituents are compatible.

E25.4.4 Copies of all reports, including but not limited to: “Record of Concrete Strength” form and material quality control test results.

E25.4.5 The Contractor shall conduct and supply copies of all the following material quality control test results:

(a) Aggregate testing specified in CSA A23.1 Clauses 4.2.3.3, 4.2.3.4, 4.2.3.5.1, 4.2.3.6, 4.2.3.7, and Tables 10, 11, and the Standard requirements for concrete exposed to freezing and thawing listed in Table 12.

(b) Abrasion and impact testing results for coarse aggregate in accordance with CSA A23.2-16A.

(c) Report on alkali-aggregate reactivity testing, CSA A23.2-27A.

(d) Report on aggregate petrographic examination, CSA A23.2-15A. Petrographic examination of the aggregate shall be done by an experienced petrographer. The weighted petrographic number shall not exceed 125. The report from the petrographer shall confirm that the aggregate is suitable for the intended use and exposure class.

(e) Report on chloride ion penetrability test ASTM C 1202.

(f) Report on the water soluble chloride ion content by mass of cementing material in the concrete, CSA A23.2-4B.

(g) Report on Air Content of Hardened Concrete ASTM C 457.

E25.4.6 All testing of concrete and concrete constituents by the Contractor shall be done by an independent laboratory certified by the Canadian Standards Association except the plastic concrete testing (Slump, Air Content and Cylinders) and concrete cylinder compressive strength testing during casting can be done by the Contractor’s Quality Control Technician (ACI Certified Concrete Testing Technician) as approved by the Engineer.

E25.5 Materials

E25.5.1 General

(a) All materials supplied under this Specification shall be of a type acceptable to 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

E25.5.2 Material for the Precast Concrete Panels

(a) Concrete: Concrete shall have a minimum compressive strength of 35 MPa at 28 days with a post-cracking residual strength index (Ri) of 0.15 using synthetic fibres and meet requirements of CSA A23.1, Exposure Class F-1 & S-1, Air Content Category 1 for hardened concrete.

(i) Coarse Aggregate

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 1% 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.

II. Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSAA23.1, Table 12, for concrete exposed to freezing and thawing.

(ii) 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.

(iii) Admixtures

I. Air-entraining admixtures shall conform to the requirements of ASTM C 260.

II. Chemical admixtures shall conform to the requirements of ASTM C 494 or C 1017 for flowing concrete.

(iv) Cementitious Materials

I. Cementitious materials shall conform to the requirements of CSA A3001.

II. 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.

III. Should the Contractor choose to include fly ash in the concrete mix design, the fly ash substitution shall not exceed 20% by mass of cement. The fly ash shall meet the following requirements:

Chemical and Physical Parameters Specification	**Specification**
CaO Content	10 - 20%
Loss of Ignition	< 1%
Fineness Retained on the 45 µm Sieve	< 15%

Blaine	300 – 400 m2/kg
Strength Activity Index	
% Control at 7 Days	≥ 85%
% Control at 28 Days	≥ 95%

(v) Synthetic Fibres

I. The synthetic fibres for the precast concrete panels shall consist of 100% virgin polypropylene. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength as specified in E25.5.2(a).

(b) Reinforcement: Plain deformed steel bars conforming to CSA Standard CAN/CSA G30.18, Grade 400W, in accordance with E23. "Supplying and Placing Reinforcing Steel".

(c) Sand: "Sand" in accordance with Table CW 2030.1, Specification CW 2030-R9.

(d) Miscellaneous Materials: Shall be of the type specified on the Drawings or approved by the Contract Administrator.

(e) Embedded Materials: Embedded materials shall conform to the requirements shown on the Drawings and described in E21.

(f) Precast Concrete Panels will be supplied to the Contractor f.o.b. Contractor's truck at the precast Fabricator's yard. The precast Fabricator will load the panels onto the Contractor's hauling equipment. Pick up of panels shall be during the Fabricator's normal working hours unless other mutually satisfactory arrangements are made between the Contractor and the Fabricator. The Contractor will be responsible for any premium charged for any panels picked up outside of the Fabricator's normal working hours.

(g) The Contractor shall be responsible for the security and integrity of the panels during transportation to site, and during unloading, storage and installation on site. Panels damaged during any of these operations shall be replaced or repaired to the satisfaction of the Engineer before final approval is granted. The decision to repair or replace the damaged panels will be entirely at the discretion of the Department.

E25.5.3 Impregnated Expanding Foam Sealant

(a) The Contractor shall supply and install the impregnated expanding foam sealant as specified on the Drawings. Impregnated expanding foam sealant must be approved as identified in the City's Approved Products List and shall be to the satisfaction of the Contract Administrator. Any impregnated expanding foam sealant that is not in the City's Approved Products List will be subject to approval by the Engineer.

E25.5.4 Preformed Expansion Joint Filler

(a) The Contractor shall supply and install the preformed expansion joint filler as specified on the Drawings. The preformed expansion joint filler shall be asphalt impregnated fibreboard satisfying ASTM D 1751 and must be approved as identified in the City's Approved Products List and shall be to the satisfaction of the Contract Administrator. Any preformed expansion joint filler that is not in the City's Approved Products List will be subject to approval by the Contract Administrator.

E25.5.5 Elastomeric Pads and Sheets

(a) The Contractor shall supply and install the elastomeric pads and sheets as specified on the Drawings and shall be subject to approval by the Contract Administrator.

E25.5.6 Anchors for Elastomeric Sheets

(a) The Contractor shall supply and install the anchors for the elastomeric sheets as specified on the Drawings or in the Special Provisions and shall be subject to approval by the Contract Administrator.

E25.5.7 Adhesive for Elastomeric Sheets

(a) The Contractor shall supply and install the adhesive for the elastomeric pads and sheets as specified on the Drawings or in the Special Provisions and shall be subject to approval by the Contract Administrator.

E25.6 Equipment

E25.6.1 General

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

E25.7 Construction Methods

E25.7.1 Fabrication of Precast Concrete Panels

(a) Dimension Tolerances

(i) Cross-sectional dimensions throughout the entire length of the panel shall not vary from those shown on the Drawings by more than 5 mm.

(ii) The locations of the reinforcing steel shall not vary from those shown on the Drawings by more than 5 mm.

(iii) For the horizontal alignment, the maximum deviation from a straight line parallel to the centreline of a panel shall be 5 mm.

(b) Placing Reinforcement:

(i) Reinforcement shall be:

I. Placed in accordance with the details shown on the Drawings.

II. Rigidly fastened together.

III. Lowered into the forms before concrete is placed.

(ii) Spacers shall be used to properly locate the reinforcing steel cage in the excavation.

(c) Forms

(i) Steel forms shall be used. The faces of the forms shall be smooth so as to impart a good finish to the concrete. Forms shall produce precast concrete panels that conform to the shape, lines and dimensions as shown on the Drawings and within the tolerances described in E25.7.1.

(ii) The faces of the forms shall be treated with a release agent to ensure that stripping may be carried out without damage to the concrete. Care shall be taken to prevent the release agent from coming in contact with any reinforcing steel or embedded materials.

(iii) All foreign substances shall be removed from the forms prior to placing the concrete.

(d) Concrete Finish

(i) Immediately after the removal of the forms, all defects in the concrete shall be repaired as directed by the Engineer, provided the defects are not extensive enough to cause rejection of the panel. Should the top surface exhibit excessive laitance or “frothing” or any other deleterious effects, the Contractor shall repair the concrete to the satisfaction of the Contract Administrator.

(ii) Honeycomb, if any, shall be repaired as soon as the forms are taken off. When approved by the Contract Administrator, repairs shall be accomplished by: removing all aggregate that is loose or that is not bonded thoroughly to the surrounding concrete, washing the sound concrete with clean water, using a wire brush to remove any loose particles, applying an approved epoxy resin to the dried areas, and applying a cementitious mortar.

(iii) The cementitious mortar shall have the same quality and mix as that used for the concrete. Patched areas shall be rubbed flush with the surrounding surface after the cementitious mortar has hardened.

(iv) All objectionable fins, projections, offsets, streaks, and other surface imperfections shall be removed totally to the Contract Administrator 's satisfaction by approved means.

(v) Finally, the concrete surface shall be wetted down thoroughly and all air pockets larger than 6 mm in diameter and other surface cavities shall be filled carefully with the approved cementitious mortar. When sufficiently dry, the surface shall be rubbed down to leave a smooth and uniform finish. Cement washes of any kind will not be allowed.

(vi) If, in the Contract Administrator 's opinion, repairs to the concrete are not satisfactory or will be detrimental to the strength or long-term durability of the panel, the Contractor shall, at his own expense and as directed by the Engineer replace the panel.

(e) Placing Concrete

(i) Concrete shall be placed to the dimensions shown on the Drawings. Hand finished surfaces shall be finished smooth with a hand float.

(ii) The form shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator.

(iii) Interruption in placing concrete shall not exceed 30 minutes.

(f) Protection of Newly Placed Concrete

(i) Newly cast concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

(g) Curing Concrete

(i) The panels shall be cured until the concrete has reached a minimum compressive strength of 35 MPa. Concrete can either be moist-cured or steam cured.

(ii) If steam-curing is used, steam shall not be applied until after the initial set has taken place. Initial set will be considered to have taken place 4 hours after the completion of concrete placing.

(iii) During steam curing, the rise in the ambient air temperature shall not exceed 15 ^{o} C per hour to a maximum temperature of 60^{o} C.

(iv) Once curing has been completed, the temperature of the concrete shall not be allowed to fall at a rate exceeding 20^{o} C per hour.

(v) The panels shall not be subjected to freezing temperatures before reaching a compressive strength of 35 MPa. The panels, including any patched areas, shall be properly cured within the plant a minimum of three (3) days before being subjected to freezing conditions. The Contractor shall monitor the rate of cooling and avoid thermal shock from prematurely subjecting the panel to freezing temperatures.

E25.7.2 Handling and Storage

(a) The Contractor shall be responsible for storage of the panels from the completion of their fabrication until they are required by the General Contractor. The Contractor may have to store, free of charge, all or portions of the fabricated material past the delivery date specified in the contract documents, for a period of up to one year.

(b) During storage, the panels shall be maintained in a horizontal position and shall be, as a minimum, supported at the corners. Care shall be exercised during the handling and storage of the precast concrete panels to avoid twisting, cracking or other distortion that may result in damage to the panel.

(c) The precast concrete panels shall be marked in accordance with Clause 27.5 of CSA A23.4. The markings shall be made with permanent (stenciling) ink on the unformed face of each panel prior to stripping the forms. Markings shall be located so that the markings are visible during storage.

(d) The General Contractor will give the Contractor 48 hours notice of his intention to pick up the panels. The Contractor shall load the panels onto the General Contractor's

hauling equipment and shall co-operate with the General Contractor as to the loading procedures.

(e) The precast concrete panels shall be picked up only by the lifting devices provided by the Fabricator. The lifting devices shall be cut off flush with the bottom of the recesses after installation.

E25.7.3 Placement of Precast Concrete Panels

(a) Excavation required for the placement of the panels shall be completed prior to panel placement.

(b) Sand shall be placed to create a level bedding between the limits of the excavation and the underside of the concrete panels.

(c) Concrete panels shall be placed plumb, with the full height of finished face bearing directly against the elastomeric sheets.

(d) Concrete panels shall be placed so that they bear on the support angles.

(e) The precast concrete panels shall be installed at the locations as indicated on the Drawings. The Contractor shall field drill holes into the precast concrete panels at the locations and in accordance with the details as indicated on the Drawings.

E25.7.4 Installation of Granular Backfill

(a) Granular backfill shall be a minimum of 0.3 m wide beyond the panels.

(b) Granular backfill shall be placed in maximum 0.3 m lifts and hand tamped to the satisfaction of the Contract Administrator.

(c) Non-woven geotextile shall be placed between the granular fill, the sub-grade, and the surrounding fill.

(d) Sand shall be used to fill all gaps between the concrete panels and the H-piles after granular backfilling operations are complete.

E25.7.5 Miscellaneous Materials

(a) All miscellaneous materials shall be installed at the locations as indicated on the Drawings. The Contractor shall clean the contact surfaces and apply the adhesive before placing the elastomeric pads and sheets at the locations and in accordance with the details as indicated on the Drawings.

E25.8 Quality Control and Assurance

E25.8.1 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 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 that are not in accordance with the requirements of this Specification.

(c) General

(i) Batches of concrete that do not meet the requirements of this Specification will be rejected by the Engineer. The Engineer reserves the right to require immediate removal of any concrete from the rejected batches that may have already been placed in the forms.

(ii) The Contractor shall be responsible for all concrete testing, including but not limited to making test cylinders, transporting cylinders to an independent certified testing laboratory of his choice, storage, curing, breaking, and providing written reports of the concrete test results to the Engineer.

(iii) All testing shall be completed by qualified personnel who are certified at the time of testing as ACI CSA-based Concrete Field Testing Technicians - Grade 1, and shall be conducted at the point of discharge into the forms.

(d) Compressive Strength tests

(i) A “Strength Test” shall consist of the compression test of four standard test specimens, sampled, cast, cured, and tested in accordance with CSA Standard Specifications as referenced with modifications as indicated. One cylinder shall be tested at seven (7) days. One cylinder shall be tested at fourteen (14) days. The 28 day test result shall be the average of the strengths of the remaining two specimens.

(ii) Additional cylinders may be cast, at the discretion of the Engineer or Contractor.

(iii) Compressive strength tests shall be completed by the Contractor for every 10 m3 of concrete placed in the forms. As a minimum, one compressive strength test shall be completed each day that concrete is placed.

(iv) Additional test cylinders shall be made, cured and tested as required by the Contractor to verify that the concrete has reached the minimum strength of 35 MPa identified in Section 5.9 of the Special Provisions.

(v) The compressive strength of the concrete shall be determined from standard 100 mm diameter x 200 mm test cylinders or 150 mm x 300 mm test cylinders that have been molded, cured and tested in accordance with CSA A23.2.

(e) Additional Testing Requirements

(i) In addition to the compressive strength tests, the Contractor shall perform and record the results of the following tests for each concrete batch:

I. Slump tests completed in accordance with CSA A23.2 – 5C.

II. Air content tests completed in accordance with CSA A23.2 – 4C.

III. Temperature tests completed in accordance with ASTM C 1064.

(ii) The Contractor shall be responsible for maintaining an up-to-date record of all test results on a "Record of Concrete Strength" form approved by the Engineer. A separate "Record of Concrete Strength" form shall be prepared for each panel and the strengths of the test cylinders as well as the pertinent data shall be listed in the same order as the batches of concrete were placed in the forms. A complete set of test results shall be submitted to the Engineer within 7 days after the date that the final cylinder from the last panel was tested.

E25.8.2 Quality Assurance

(a) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

(b) Visual inspection and sampling will be done in the fabrication plant by the Contract Administrator to confirm the material supplied and the fabrication has been done as specified on the Drawings, in this Specification and in the Special Provisions. The Contractor shall supply material specimens for concrete testing when requested by the Contract Administrator.

(c) The Contract Administrator, at their discretion and CoW’s expense, may complete other tests deemed necessary on: a) the concrete, b) the concrete constituent materials or c) any finished or partially finished panel. The Contractor shall allow the Contract Administrator unhindered access to the concrete, concrete constituent materials and panels and shall assist the Contract Administrator in carrying out any test.

(d) During fabrication of the precast concrete panels, the Contractor shall weigh completed panels to verify the mass when requested by the Contract Administrator.

(e) After all precast concrete panels have been installed, the Contractor and the Contract Administrator shall conduct a final inspection to locate any damage or deficiencies. All

visible damage or deficiencies shall be repaired by the Contractor to the satisfaction of the Contract Administrator and acceptable to the Department before final approval is granted.

E25.9 Measurement and Payment

E25.9.1 Fabricate and Supply of Precast Concrete Panels

(a) Fabrication and supply of Precast Concrete Panels shall be measured on area basis and paid for at the Contract Unit Price per square metre for "Fabricate and Supply of Precast Panels" for the "Items of Work" listed here below, which shall be payment in full for all operations herein described for the fabrication and supply of precast concrete panels including supply, placement, and finishing of concrete; supplying and placing of reinforcing; furnishing of the panels to site; and all other items incidental to the Work included in this Specification.

E25.9.2 Install Precast Panels

(a) Install Precast Concrete Panels shall be measured and paid for on a area basis and paid for at the Contract Unit Price per square metre for "Install Precast Panels" for the "Items of Work" listed here below, which shall be payment in full for all operations herein described for the installation of precast concrete panels including placement of panels; installation of geotextile and backfill; supply and installation of all other miscellaneous attachments to the primary pile components; and all other items incidental to the Work included in this Specification.

E25.9.3 Items of Work

(a) Fabricate and Supply Precast Concrete Panels
  (i) Abutment Wall Precast Concrete Panels
  (ii) Wingwall Precast Concrete Panels

(b) Install Precast Panels
  (i) Abutment Wall Precast Concrete Panels
  (ii) Wingwall Precast Concrete Panels

E26. PRECAST PRESTRESSED CONCRETE GIRDERS

E26.1 Description

E26.1.1 The Work under this Specification shall cover the supply of all materials, labour, plant, and equipment required to complete the fabrication of precast prestressed concrete channel girders, as shown on the Drawings.

E26.1.2 The Work shall also involve the storage of fabricated girders until delivered to the Site for erection.

E26.1.3 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 other things necessary for and incidental to the satisfactory completion of all Work as herein specified and as indicated on the Drawings.

E26.2 References

E26.2.1 The latest edition and subsequent revisions of the following:

(a) CAN/CSA A23. 1/23.2 - Concrete Materials and Method of Concrete Construction - CSA A23.4 - Precast Concrete Materials and Construction;

(b) CAN/CSA-A3001 - Cementitious Materials for Use in Concrete;

(c) CAN/CSA G30.14 – Deformed Steel Wire for Concrete Reinforcement;

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

(e) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel;

(f) CAN/CSA G164 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(g) A416 –Standard Specification for Low-Relaxation Seven-Wire Strand for Prestressed Concrete;

(h) CAN/CSA W47.1 - Certification of Companies for Fusion Welding of Steel;

(i) ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished;

(j) ASTM A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications;

(k) ASTM A496 - Standard Specification for Steel Wire, Deformed for Concrete Reinforcement;

(l) ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete;

(m) ASTM C494 - Standard Specification for Chemical Admixtures for Concrete;

(n) ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

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

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

(q) Precast Prestressed Concrete Institute (PCI) MNL 135-00 – Tolerance Manual for Precast and Prestressed Concrete Construction.

E26.2.2 The following specifications:

(a) E22, "Structural Concrete";

(b) E23, "Supplying and Placing Reinforcing Steel";

(c) E26, "Precast Prestressed Concrete Girders"; and

(d) E27, "Steel Reinforced Elastomeric Bearing Pads"

E26.3 Scope of Work

E26.3.1 The Work under this Specification shall involve:

(a) Fabricating precast prestressed concrete channel girders;

(b) Supplying all miscellaneous components required for the precast prestressed concrete channel girders; and

(c) Storing precast prestressed concrete channel girders until delivery to site.

E26.4 Submittals

E26.4.1 General

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

E26.4.2 Qualification

(a) The Contractor shall submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to the commencement of any girder fabrication, a certificate of compliance with the CPCI Precast Concrete Certification Program for Structural, Architectural, and Specialty Precast Concrete Products and Systems, Group B, Bridge Products.

(b) The Contractor shall submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to the commencement of any girder fabrication, a

letter of validation from the Canadian Welding Bureau (CWB) and CWB approved welding procedures for the Fabricator's miscellaneous metal supplier. The Fabricator's miscellaneous metal Supplier shall fulfill the requirements of CAN/CSA W47.1, Division 2.1 (minimum).

E26.4.3 Concrete Mix Design Statement

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator that reflects the specified performance properties of the concrete, including the minimum compressive strengths (f'c and f'ci). 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.

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

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

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

(iii) Aggregate source location(s);

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

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

(vi) The limits for slump;

(vii) The limits for air content; and

(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled fabrication of girders. The concrete mix design must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of girder fabrication.

(d) The mix design statement shall also include the expected slump measurement. The tolerances will be used for acceptance of slump measurements during girder fabrication by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

(e) The concrete mix design and mix design statement shall be stamped, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(f) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

E26.4.4 Concrete Mix Design Test Data

(a) The Contractor shall submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to commencement of fabrication of girders, all quality control test data that demonstrates the concrete to be supplied will meet the performance criteria stated in this Specification. As a minimum the following shall be supplied:

(i) The test data shall prove that the minimum compressive strength, density, air content, temperature and slump of the concrete to be supplied meets or exceeds the performance criteria.

(ii) All testing of concrete and concrete constituents by the Fabricator shall be done by an independent laboratory certified in accordance with CAN/CSA A283 for the appropriate category. Concrete materials testing results shall not be more than 12 months old at time of submission, with the exception of CAN/CSA A23.2-2A and CAN/CSA A23.2-5A which shall not be older than 90 days at time of submission.

(iii) All aggregates shall comply with CAN/CSA A23.1, Clauses 4.2.3.1 to 4.2.3.6. Aggregate testing specified in CAN/CSA A23.1, Clauses 4.2.3.3, 4.2.3.4, 4.2.3.5.1, 4.2.3.6, 4.2.3.7, and Tables 10, 11, and the Standard requirements for concrete exposed to freezing and thawing listed in Table 12;

(iv) Abrasion and impact testing results for coarse aggregate in accordance with CAN/CSA A23.2-16A;

(v) Report on alkali-aggregate reactivity testing, CAN/CSA A23.2-27A, A23.2-1 4A or CAN/CSA A23.2-25A;

(vi) Report on aggregate petrographic examination, CAN/CSA A23.2-15A. 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;

(vii) Resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CAN/CSA A23.2-16A;

(viii) Report on chloride ion penetrability test ASTM C1202 or CAN/CSA A23.2-23C;

(ix) Report on the water soluble chloride ion content by mass of cementing material in the concrete, CAN/CSA A23.2-4B; and

(x) Report on Air Content of Hardened Concrete tested in accordance with ASTM C457 for all concrete mixes with a specified Category 1 air content.

E26.4.5 Stressing Calculations

(a) The Contractor to submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to commencement of any scheduled Work on Site, copies of the stressing calculations which include the following:

(i) Copies of the stressing sequence and strand elongation calculations as well as all data required for checking these calculations. Separate elongation calculations will be required for each significant variation in the Modulus of Elasticity of the strand;

(ii) A calibration graph for each jack, calibrated not more than 6 months prior to stressing operation;

(iii) The proposed method of tensioning draped strands, including a comprehensive description and drawing of the proposed hold-up and hold-down devices;

(iv) The proposed sequence of stressing and destressing operations;

(v) The anchorage losses experienced by the Contractor under similar loading applications, and the proposed method of measuring the anchorage losses during the stressing operation;

(vi) A copy of the proposed "Record of Concrete Strength" and "Record of Pre-Tensioning" forms to be used by the Contractor;

(vii) Stressing calculations shall be stamped, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba; and

(viii) Copies of the stress-strain curve for the prestressing steel and the lateral stressing cables;

E26.4.6 Quality Control Test Data

(a) The Contractor shall provide to the Contract Administrator al Quality Control test data and reports during fabrication of girders. At a minimum the following shall be supplied:

(i) For concrete, record of concrete pour and strength results, and any other material quality control test results; and

(ii) For prestressing steel, record of pre-tensioning forms to be used by the Fabricator.

E26.4.7 Prestressing Steel Submittals

(a) The Contractor submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the mill certificates for all prestressing steel.

(b) The Contractor submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, testing for a minimum of three representative specimens of the strands to be used in the girders.

E26.5 Materials

E26.5.1 General

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

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

(c) Materials shall be obtained from the same source of supply or Manufacturer for the duration of the Contract.

E26.5.2 Handling and Storage of Materials

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

(b) Storage of materials shall conform to CSA Standards A23.1 and A23.4.

E26.5.3 Concrete

(a) Concrete shall have minimum compressive strengths (f'c and f'ci) as shown on the Drawings and meet the requirements of CSA-A23.1, Exposure Class C-1, Air Content Category 1 for hardened concrete.

E26.5.4 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(b) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12.

(c) Coarse Aggregate

(i) The maximum nominal size of coarse aggregate shall be 10 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 1% 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) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E26.5.5 Admixtures

(a) Air-entraining admixtures shall conform to the requirements of ASTM C260.

(b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E26.5.6 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

(b) Should the Fabricator choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass normal Portland cement. Condensed silica fume shall conform to CAN/CSA A3000, Type SF, with a SiO2 content of at least 85%, a maximum of 10% ignition loss and no more than 1% SO3 content. A compatible superplasticizing admixture accepted by the Contract Administrator shall be used together with the silica fume.

(c) Should the Fabricator choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 and the substitution shall not exceed 20% by mass of normal Portland cement. Fly ash shall conform to CAN/CSA A3000, Class C-1.

(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.

E26.5.7 Water

(a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CAN/CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances.

E26.5.8 Prestressing Steel

(a) Stressing steel shall be uncoated, minimum ultimate strength of 1860 MPa, low relaxation 7-wire strand conforming to the requirements of CAN/CSA G279 and this Specification.

(b) Size of strand, coil number, heat number and the mark of the Manufacturer shall be recorded on a tag attached securely to each reel. The tag shall also identify the strand with its own stress-strain curve.

(c) One stress-strain curve shall be provided by the Manufacturer for each reel.

(d) Where mill test certificates originate from a mill outside Canada or the United States of America, the Contractor shall have the information of the mill test certificate verified by independent testing by a Canadian laboratory. The laboratory shall be certified by

an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of test required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date, and the signature of an authorized office of the Canadian laboratory.

E26.5.9 Testing

(a) Should the Contract Administrator consider it necessary, approval of the prestressing strand, in addition to the requirements of CSA G279, shall be based on tests carried out by the Fabricator at his expense in a testing laboratory satisfactory to the Contract Administrator. The Fabricator shall test a minimum of three representative specimens of the strands to be used in the girders. The results of these tests shall be supplied to the Contract Administrator. The Contract Administrator may also require the Fabricator to supply additional representative specimens for independent testing if the results are deemed unsatisfactory or inconclusive.

(b) Where the strand has rusted in storage, the use of such material will be subject to approval by the Contract Administrator. The Contract Administrator, at his discretion, may require physical tests at the Fabricator's expense in order to determine whether the material is suitable for use in the girder.

(c) All strands that are contaminated by substances having a deleterious effect on the steel or concrete or on the bond strength of concrete to strand, and all strands that sustain physical damage, shall either be replaced or cleaned to the satisfaction of the Contract Administrator at the Fabricator's expense.

(d) Stressing strand splices shall not be placed within a precast component.

E26.5.10 Reinforcing Steel

(a) Reinforcing steel shall conform to the requirements of CAN/CSA G30.18, Grade 400W.

(b) Deformed steel wire shall conform to the requirements of CAN/CSA G30.14, Grade 480W.

(c) Stainless steel reinforcing shall conform to the requirements of E23, "Reinforcing Steel".

E26.5.11 Embedded Materials

(a) Embedded materials shall be Grade 300W and shall conform to the requirements of CAN/CSA G40.20/G40.21.

(b) All embedded components shall be hot dip galvanized to a net retention of 610 g/m^2 and shall conform to the requirement of CAN/CSA G164.

E26.5.12 Girder Lifting Hooks

(a) Lifting hooks shall be made of stressing strand conforming to the requirements for prestressing strand in this Specification.

(b) Lifting hook material shall be hot dip galvanized to a net retention of 610 g/m^2 and shall conform to the requirements of CAN/CSA G164.

E26.5.13 Screed Plates

(a) Screed plates shall be stainless steel Grade 300W and shall conform to the requirements of CAN/CSA G40.20/G40.21.

E26.5.14 Other Materials

(a) Miscellaneous metal, anchor inserts, lifting devices, and all other materials shall be considered incidental to the supply of girders and shall be subject to the approval of the Contract Administrator.

(b) Any proposed inserts or additions to the girders to accommodate any formwork or false work by the Contractor shall be submitted formally to the Contract Administrator for review and approval.

E26.5.15 Replacing Damaged Materials

(a) All material supplied by the Fabricator that in the opinion of the Contract Administrator has been damaged or otherwise rendered unusable by improper storage or handling by the Fabricator shall be replaced by the Fabricator at his own expense.

E26.5.16 Form Retarder

(a) Form retarder for achieving exposed aggregate finish in areas to be in contact with grout after girder erection shall be MBT Tuf-Cote, MasterFinish HC or approved equal as accepted by the Contract Administrator.

E26.5.17 Compressible Foam Pads for Lateral Stressing Operations

(a) Compressible foam pads between girders which provide a seal against grout leakage during lateral stressing operations shall be compressible foam of a type acceptable to the Contract Administrator.

E26.6 Equipment

E26.6.1 General

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

E26.6.2 Stressing

(a) Hydraulic jacks and pumps of sufficient capacity shall be used for prestressing of strands.

(b) The force induced in the stressing strand shall be measured using calibrated jacking gauges, load cells or a calibrated dynamometer.

(c) The pressure gauge shall have an accurate reading dial at least 150 mm in diameter.

(d) The forces to be measured shall be within twenty-five (25) and seventy-five (75) percent of the total graduated capacity of the gauge, unless calibration data clearly establishes consistent accuracy over a wider range.

(e) The measuring devices shall be calibrated at least once every six months. The jack and the gauge shall be calibrated as a unit. A certified calibration chart shall be kept with each gauge.

E26.7 Fabrication

E26.7.1 General

(a) All precast concrete components shall be plant manufactured by a Fabricator currently engaged in the special process of precast and prestressed concrete work. This Fabricator shall be a registered member of the Canadian Prestressed Concrete Institute.

(b) All plant casting operations for the production of prestressed and precast concrete shall be under the direct supervision of a Registered Professional Engineer in the Province of Manitoba.

(c) The casting operations of the Fabricator shall be continuously open to inspection by representatives of the Contract Administrator. Complete and up-to-date copies of all Shop Drawings together with a complete set of the Contract Drawings and Specifications shall be kept available for their use.

(d) During production of the precast members, weight checks shall be carried out on completed units when requested by the Contract Administrator.

(e) Mark each member with identifying number and date of casting.

E26.7.2 Inspection

(a) The Fabricator 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, reinforcing steel, installation of voids and hardware, stressing, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator

E26.7.3 Tolerances

(a) The distance centreline to centreline of bearings shall not vary by more than 6 mm from the lengths shown on the Drawings, when measured 12 hours after the completion of the stress transfer.

(b) Cross sectional dimensions throughout the entire length of the girder shall not vary from those shown on the Drawings by more than 3 mm.

(c) The locations of prestressing steel shall not vary from those shown on the Drawings by more than 3 mm. The tolerance for the positioning of void forms in the box girders shall be 3 mm for the concrete dimensions, concurrent with either no loss in mass for the unit or an increase in mass not exceeding three percent of the design dead load mass of the unit.

(d) Length of the girders shall not vary from those shown on the Drawings by more than 6mm.

(e) The bottom surface of members at the bearing areas or the bottom surface of steel plates cast into the girders shall be in a true level plane, which does not vary by more than 2 mm from a true straight edge placed in any direction across the bearing area or steel plate.

(f) The maximum deviation for girder dimensional tolerances shall be:

(i) Length = ±6 mm;

(ii) Cross sectional dimensions = ±3 mm;

(iii) Prestressing steel = +- 3mm;

(iv) Differential camber between adjacent members of same design; 6 mm;

(v) Location of embedded plates for structural connections; tolerance ±3 mm;

(g) The maximum deviation for other miscellaneous dimensional tolerances shall be:

(i) Bulkheads – warpage or tilt of ends no more than 5mm;

(ii) Dowel holes – out of plum no more than 5 mm; and

(iii) Void location – surface to void dimension + 15 mm after casting.

E26.7.4 Outside Forms

(a) Precast concrete units shall be fabricated in steel forms accepted by the Contract Administrator.

(b) The faces of the forms shall be smooth so as to impart a good finish to the concrete and particular care shall be taken to ensure the verticality and rigidity of the side forms of the deck units forming surfaces which will be in contact with each other after erection. Forms shall result in precast prestressed girders that conform to the shape, lines and dimensions as shown on the Drawings and within the tolerances described in E26.7.3. Forms shall be properly braced or tied together to maintain position and shape.

(c) The forms shall be designed so that they can be removed without damaging the girder.

(d) Forms shall be designed for the rate and method of concrete placement and constructed to allow for the redistribution of loading and the movement of the form that will take place upon application of the prestressing force.

(e) The faces of the forms shall be treated with release agent to ensure that stripping may be carried out without damage to the concrete. Care shall be taken to prevent the release agent from coming in contact with any reinforcement, prestressing strand or embedded materials.

(f) Forms shall include temporary openings to facilitate the removal of all foreign substances prior to placing the concrete.

(g) The forms shall be designed so that they can be removed without damaging the girder.

(h) Recesses at the ends of the girders to facilitate positioning of prestressing strands will not be allowed.

E26.7.5 Installation of Embedded Materials

(a) Embedded materials shall be placed in the positions as indicated on the Drawings, and fixed securely to the forms to ensure that there is no displacement during the placing and vibrating of concrete.

E26.7.6 Stressing

(a) The submission of the stressing calculations to the Contract Administrator shall in no way relieve the Fabricator of the full responsibility for the success or failure of the stressing operations.

(b) The initial force in each strand shall be as shown on the Drawings. Prior to the stressing of the strands to the initial force, a 10.0 kN load shall be applied to each strand to eliminate slack and equalize stresses. The 10.0 kN load shall be applied to all strands and then rechecked before stressing any of the strands to the initial force.

(c) A pre-calibrated pressure gauge, tensionmeter, or load cell shall be used as a check on the elongation, the accuracy of which shall be verified by the Fabricator whenever the Contract Administrator considers it necessary.

(d) The method of draping pretensioned strands shall be approved by the Contract Administrator. The method shall ensure that the strands are held true to the locations shown on the Drawings within a tolerance of 3 mm.

(e) Stressing strands shall not be stressed more than 12 hours prior to being encased in concrete. The stress in the stressing strands shall be measured both by jacking gauges and by elongation of the strands.

(f) Seven wire stressing strands with any broken wire shall be removed and replaced. All stressing strands shall be checked for wire breaks before placement of concrete.

(g) Before the stressing operation begins, the Fabricator shall have filled in on the approved “Record of Pretensioning” form the calculated jack gauge reading, the required gross elongation (based on estimated anchorage losses), and the required net elongation for each strand. During stressing operations, the Fabricator shall record the actual jack gauge reading, measured gross elongation, measured anchorage losses, and then calculate the actual net elongation for each strand.

(h) Tensioning shall be carried out so that the jack is coaxial with the tendon or strand. If the strands are tensioned individually, care shall be taken to ensure that unravelling of the strands does not take place.

(i) Actual net elongation of a strand shall not vary from the required net elongation by more than one (1) percent or 3 mm, whichever is smaller. The actual anchorage losses encountered shall be used to modify the gross elongation required, if the actual net elongations are consistently greater or less than the required net elongation.

(j) At no time shall the actual jack pressure vary from the pressure corresponding to the calculated gross elongation by more than five (5) percent. If the required gross elongation is not obtained by stressing to this maximum allowable jack pressure at one end of the girder, it will be necessary to complete the stressing from the other end of the girder.

(k) The jack calibration shall be repeated at any given time that a gauging system indications erratic results and at intervals not greater than six (6) months during regular usage or not greater than twelve (12) months for other conditions of use.

(l) The Fabricator shall have on hand a calibrated load cell that can be used to verify the actual load in the strand as a means of checking the elongation whenever the Contract Administrator considers it necessary.

(m) Tensioning shall be carried out in a manner such that the jack is coaxial with the tendon or strand. If the strands are tensioned individually, care shall be taken to ensure that unravelling of the strand does not take place.

(n) A copy of the "Record of Pretensioning" form shall be submitted to the Contract Administrator upon completion of the pretensioning of each girder.

(o) For pretensioned girders, the Contract Administrator has allowed for a stress loss due to an increase in temperature of the prestressing strands from the time of tensioning to the time of initial set of the concrete. In order to verify the design values used for this stress loss, the Fabricator shall keep an accurate record of the temperature of the concrete in each girder from the time of placing of the concrete until the completion of curing.

(p) For draped strands, the stressing shall be done from both ends, unless the required gross elongation can be obtained during the stressing at the initial end without exceeding the maximum allowable jack pressure. To ensure a uniform tension, the strands shall be held in their draped position by means of low friction pins or rollers at all hold-up and hold-down points.

(q) The transfer of the pretensioning force from the bulkheads to the girder shall not be carried out until the concrete has reached the minimum compressive strength as shown on the Drawings or as specified by the Contract Administrator. The cylinders used to determine this strength shall be cured under the same circumstances as the concrete of the girder in question (i.e., match cured). Transfer of the pretensioning force shall be carried out by a method approved by the Contract Administrator. If the strands are to be cut, the destressing sequence shall be subject to approval by the Contract Administrator.

(r) All pretensioning strands shall be cut off flush with the end of the girder unless noted otherwise on the Drawings. The exposed ends of the pretensioning strands and a 50 mm strip of adjacent concrete shall be cleaned and painted unless noted otherwise on the Drawings or are to be encased in field cast concrete. Cleaning shall be by abrasive blast to remove all dirt and residue that is not firmly bonded to the concrete surface. The surfaces shall be coated immediately with one thick coat of zinc-rich paint or other waterproofing material approved by the Contract Administrator. The paint shall be mixed thoroughly at the time of application and shall be worked into all voids in the pretensioning strands.

E26.7.7 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 bar accessories and wires to that the reinforcement shall not be moved out of alignment during or after the depositing of concrete. Bar accessories shall be made from non-rusting material. Concrete bar supports and sidewall spacers such as "Total Bond" concrete reinforcement supports, as supplied by ConSys Inc., or equivalent as approved in accordance with B7, "Substitutes".

(b) Reinforcing steel shall be kept free of all foreign materials in order to ensure a positive bond between the concrete and reinforcement. The Fabricator shall remove any material that has been deposited on the reinforcement before concrete is placed.

(c) Intersecting bars shall be tied positively at each intersection.

(d) The reinforcement shall be inspected by the Contract Administrator prior to placement of concrete.

(e) Installation of reinforcing steel shall take place in accordance with E23, "Supplying and Placing Reinforcing Steel".

E26.7.8 Placing Concrete

(a) The temperature of the mixed concrete shall not be less than 10°C and not more than 25°C at the time of placing in the forms. Aggregates shall be heated to a temperature of not more than 65°C. The heating apparatus and the housing for the aggregates shall be sufficient to heat the aggregates uniformly without the possibility of the occurrence of hot spots that may burn the materials. The water shall be heated to a temperature of not more than 65°C.

(b) Concrete shall be deposited carefully and vibrated so that it fills the forms completely and makes complete contact with all reinforcement, prestressing strands, ducts, anchorages and embedded materials.

(c) Concrete shall be deposited at frequent locations within the forms so that there shall not be a necessity to move large quantities of concrete from place to place in the forms. The concrete shall be vibrated into sufficient place by methods that do not permit the constituent materials to segregate. The Fabricator shall provide sufficient personnel to deposit and vibrate the concrete and shall ensure that each batch of concrete is vibrated properly into place as it is deposited.

(d) Buckets, chutes and other equipment used to deposit concrete in the forms shall be positioned as close to the top of the forms as possible to minimize the free fall of the concrete.

(e) Depositing of concrete shall be a single continuous compete operation so that each girder shall be monolithic without joints. The time from the initial mixing of the concrete until placing the concrete in the forms shall not exceed one hour. The elapsed time between placement of the concrete onto previously placed concrete shall not exceed 30 minutes.

(f) Before any concrete shall be deposited, the interior of the forms shall be cleaned of all chips, earth, shavings, sawdust, rubbish or other foreign substances.

E26.7.9 Vibrating Concrete

(a) Internal vibrators shall be used in all sections that are sufficiently large and they shall be supplemented by platform or screed-type vibrators in the event that satisfactory top surfaces cannot be obtained with the internal type alone. Internal vibrators shall be supplemented with vibrators operated against that outside of the forms to improve the finish of vertical concrete surfaces.

(b) External vibration shall be used when sections are too small or inaccessible for internal vibrators.

(c) Vibrators shall be of sturdy construction, adequately powered and capable of transmitting to the concrete not less than 3,600 impulses per minute when operating under load. The vibration shall be sufficiently intense to cause the concrete to flow or settle readily into place.

(d) A sufficient number of vibrators shall be employed so that at the required rate of placement, vibration and complete compaction are obtained throughout the entire volume of each layer of the concrete. At least one extra vibrator shall be on hand for emergency use.

(e) Internal vibrators shall be constantly moving vertically in the concrete and shall be applied at points uniformly spaced that are not farther apart than the radius over which the vibrator is visibly effective. Internal vibrators shall be applied close enough to the forms to vibrate the surface concrete effectively but care shall be taken to avoid displacing or damaging the forms. For successive lifts of concrete the vibrator shall be inserted to a depth equal to the length of the vibrating head into the underlying lift to provide complete consolidation.

(f) Form vibrators shall be attached to the forms in such a manner as to transmit the vibration to the concrete effectively and the vibrators shall be raised in lifts as filling of the forms proceeds. The height of each lift shall not be more than the height of concrete visibly affected by the vibration. The form vibrators shall be spaced horizontally at distances not greater than the radius that the concrete is visibly affected.

(g) With form or internal vibrators, the vibration shall be of sufficient duration and intensity to thoroughly consolidate the concrete but shall not be continued so as to cause segregation or draw a pool of grout from the surrounding area.

(h) Surface vibrators shall be applied only long enough to embed the coarse aggregate and to bring enough mortar to the surface for satisfactory screeding.

(i) Care shall be exercised so as not to damage the prestressing strand in any way or transfer the vibration through the strand to concrete that has already been placed and has started to set.

E26.7.10 Concrete Finish

(a) The following formed surfaces require an exposed aggregate finish:

(i) Exposed surfaces to received additional concrete in accordance with the Drawings;

(ii) Exposed surfaces in the recesses for lifting devices, etc.; and,

(iii) Interior portions of the fixed end dowel holes; unless corrugated galvanized steel ducting (Kopex) as stay-in-place formwork embedded in the girder to form the dowel hole. Submit proposed stay-in-place dowel hole product for Contract Administrator's review and acceptance.

(iv) Girder ends to be embedded in cast-in-place end blocks at the bridge abutments.

(b) The top surfaces of the girders shall be finished to produce even indentations at right angles to the longitudinal centreline of the girders. The indentations shall be 6 mm (minimum), full amplitude and spaced not greater than 15 mm apart.

(c) The Fabricator shall construct a 25 mm deep recess around all lifting devices. These recesses shall be rectangular in shape with vertical sides, and the distance between the lifting device and the vertical sides shall not exceed 50 mm.

(d) Prestressing strand ends shall be recessed 19 mm deep from the girder end face using a 38 mm wide expanded foam doughnut or other means as approved by the Contract Administrator. After transfer, the projecting strand is to be cut back flush with the backside of the recess. The recesses shall be cleaned and patched as per this Specification, except that an approved epoxy bonding agent shall be applied to the recess surfaces before placing the grout.

(e) The concrete surfaces of continuous shear keys shall be rough, clean, free of laitance and prepared to produce a CSP 4 concrete surface profile in accordance with the ICRI Guideline No. 03732. The method for roughening and cleaning the above surfaces shall be approved by the Contract Administrator.

(f) Immediately after the removal of the forms, all defects in the concrete shall be repaired as directed by the Contract Administrator, provided the defects are not extensive enough to cause rejection of the girder. Should the top surface exhibit excessive laitance or "frothing", or any other deleterious effects, the Fabricator shall repair the concrete to the satisfaction of the Contract Administrator

(g) Honeycomb, if any, shall be repaired as soon as the forms are taken off. When approved by the Contract Administrator, repairs shall be accomplished by: saw cutting a regular pattern around the damaged area to a minimum depth of 2/3 the depth of concrete cover (keeping clear of any reinforcing steel); chipping concrete back for a constant depth along the edges; removing all concrete that is loose or that is not bonded thoroughly to the surrounding concrete; washing the sound concrete with clean water; using a wire brush to remove any loose particles; applying an approved epoxy bonding agent to the patch are after the surface has thoroughly dried; and patching with a high strength non shrink grout. Patched areas shall be ground flush and true with the surrounding surface after the cementitious grout has hardened and gained sufficient strength.

(h) Holes made by hold-up or hold-down devices or other fabrication equipment, shall be cleaned of all oil and grease, washed with clean water and then, without delay, patched flush with the surface of the girder with the approved cementitious grout.

(i) All objectionable fins, projections, offsets, streaks and other surface imperfections shall be removed totally to the Contract Administrator's satisfaction by approved means.

(j) Finally, the concrete surface shall be wetted down thoroughly and all air pockets and other surface cavities shall be filled carefully with the approved cementitious grout. When sufficiently dry, the surface shall be rubbed down to leave a smooth and uniform finish. Cement washes of any kind will not be allowed.

(k) If, in the Contract Administrator's opinion, repairs to the concrete are not satisfactory or will be detrimental to the strength or long term durability of the girder, the Fabricator shall, at his own expense and as directed by the Contract Administrator, replace the girder.

E26.7.11 Component Identification

(a) Fabricator's name, year of manufacture, unit serial number and design loading shall be cast into the bottom of the units in 50 mm letters about 1.0 m from the unit end.

E26.7.12 Curing

(a) Concrete shall be either moist cured for a minimum of 72 hours from the time of casting or steam cured until the concrete has reached a strength (f'_{ci}) as shown on the Drawings or as specified by the Contract Administrator. The accelerated curing cycle for the precast concrete shall be as specified for moisture category damp in CAN/CSA A23.4, Table 2 – Accelerated Curing Cycle.

(b) If steam curing is used, it shall not be applied until after the initial set has taken place. Initial set shall be considered to have taken place four (4) hours after the completion of placing concrete. The cylinders used to determine the concrete strength shall be cured under the same conditions as the girder in question.

(c) From the time of pretensioning to the time of initial set, the ambient air temperature of the girder shall not vary by more than ± 3C. During steam curing, the rise in ambient air temperature shall not exceed 15^0C per hour to a maximum temperature of 60^0C.

(d) Three (3) thermocouples approved by the Contract Administrator shall be placed within the girder after placing of concrete is completed and the thermocouples shall not be removed until after steam curing has been completed. A graph showing the internal temperature plotted against the time of day shall be submitted to the Contract Administrator by the Fabricator upon completion of the steam curing for each girder and prior to any subsequent casting. The graph shall be properly identified as to the hour, day, month and year, as well as to the times of the completion of placing concrete, and of the start and completion of steam curing.

(e) Once curing has been completed, the temperature of the concrete shall not be allowed to fall at a rate exceeding 20C per hour.

(f) The girder, including any patched areas, shall be properly cured and stored within the plant a minimum of three (3) days. The Fabricator shall monitor the rate of cooling of the girder and avoid thermal shock from prematurely subjecting the girder to freezing temperatures. The Fabricator shall not subject any girder to freezing temperatures before the girder has reached 85 percent of the design strength (f'_c) as shown on the Drawings.

E26.7.13 Repairing Damaged Concrete

(a) Serious damage, honeycomb and other casting defects shall be immediately reported to the Contract Administrator. Repair procedures shall be submitted for review by the Contract Administrator prior to commencement of the repair. All repairs shall be completed prior to curing of the unit.

(b) Repairs to defects including cracks, honeycombs or spalls shall be carried out in accordance with the following requirements. Any unacceptable cracks, honeycombs or spalls will result in rejection of the affected unit.

(c) All repair procedures shall be developed by a Professional Engineer, reviewed by the Contract Administrator and accepted by the Department prior to the commencement of the repair. All repairs shall be completed prior to curing of the unit at an ambient temperature of 15^0C to 30^0C.

(d) The "bearing area" of a girder is defined as the portion of the girder bottom flange extending from the end of the girder to the inside edge of the girder bearing. It does not include the transition between the bottom flange and the web. The "anchorage area" is defined as the full height portion of the girder that is less than two times the girder depth from the end of the girder but is not in the bearing area.

(i) Cracking

I. Cracking in the bearing area of a girder are unacceptable unless they are less than 0.1 mm in width and are initiated by a stress raiser, such as a formed hole in the girder. Unacceptable cracks in the bearing area will result in the rejection of the unit.

II. Cracking in the anchorage area of a girder exceeding 0.7 mm in width are unacceptable and will result in the rejection of the unit. All cracks in the anchorage area 0.2 mm to 0.7 mm in width shall be repaired by epoxy injection in accordance with the manufacturer's instructions.

III. Coring shall be carried out to confirm the penetration of the epoxy into the cracks if so requested by the Contract Administrator.

IV. Cracking outside the girder bearing and anchorage areas that are wider than 0.3 mm or longer than 300 mm are unacceptable and will result in the rejection of the unit.

(ii) Honeycombing and Spalling

I. Honeycombing or spalling in the bearing areas of a girder are unacceptable and will result in rejection of the unit.

II. Major honeycombing and spalling in the anchorage areas of a girder are unacceptable and will result in rejection of the unit. Major honeycombs and spalls are described as honeycombs and spalls that are more than 30 mm deep or more than 0.1 m^2 in area. Repairs of minor honeycombs and spalls in the anchorage areas of a girder may be made after destressing of the girder.

III. Major honeycombing and spalling in the anchorage areas of a girder are unacceptable and will result in rejection of the unit. Major honeycombs and spalls are described as honeycombs and spalls that are more than 30 mm deep or more than 0.1 m^2 in area. Repairs of minor honeycombs and spalls in the anchorage areas of a girder may be made after destressing of the girder.

IV. Repairs of honeycombing and spalling outside of the bearing or anchorage areas of a girder may be made using cementitious material in accordance with this Specification prior to destressing of the girder.

E26.7.14 Handling and Storage

(a) The lifting devices shall be of such a nature as to avoid twisting, racking or other distortions while handling, storing, moving and erecting the girders. The devices shall be anchored fully to the main body of concrete. The devices shown on the Drawings are minimum requirements and the Fabricator shall satisfy himself as to the adequacy of the devices. The girders shall be picked up only by the lifting devices.

(b) The Fabricator shall be responsible for storage of the girders from the completion of their fabrication until they are required by the Contractor. The Fabricator may have to store, free of charge, all or portions of the fabricated material for up to one (1) year

past the delivery date specified in the Contract documents, depending upon the actual progress of the Contractor.

(c) During storage and hauling, the girders shall be maintained in an upright position and shall be supported within 50 mm on the inside of the bearing area. Where girders are to be erected within six (6) months of the fabrication date short blocking may be required from the date of manufacture to facilitate desired camber as required by the Contract Administrator. Extreme care shall be exercised during the handling and storage of the precast girders to avoid twisting, cracking or other distortion that may result in damage to the girder.

(d) The Contractor will give the Fabricator seven (7) days' notice of his intention to erect the girders and the sequence for transporting the girders. The Fabricator will be responsible for loading the girders on the Contractor's transportation equipment at the Fabricator's yard.

E26.8 Handling and transporting Girders from Outside Manitoba

(a) The Fabricator shall notify the Contract Administrator at least fourteen (14) days prior to any girders being fabricated outside of the Province of Manitoba.

(b) All loading and hauling of the girders to be supplied f.o.b. General Contractor's truck within the City of Winnipeg shall be under the direction of a Professional Engineer, registered in the Province of Manitoba. This Engineer shall be experienced in bridge girder loading and hauling shall be present for all stages of girder loading and hauling.

(c) When transporting bridge girders suing equipment other than a flatbed trailer, the Contractor shall be responsible for ensuring the following:

(i) Pilot vehicles meet the requirements of Part 9, Highway Traffic Act, Regulation 575/88;

(ii) Travel speed not to exceed 80 kph;

(iii) Travel only in daylight between sunrise and sunset; and

(iv) Travel will not be allowed on weekends or statutory holidays unless authorized by the Contract Administrator.

(d) The Fabricator shall submit his proposed route for transporting the girders including traffic control procedures as part of the proposed loading and hauling procedure.

(e) The Fabricator shall be responsible for the design, supply, installation and removal of lateral stability bracing for girders as may be required during the Contractor's handling and transporting of the girders.

(f) No loose timber blocking will be permitted for use a temporary works for any aspect of girder handling and hauling.

(g) It is the Fabricator's responsibility to ascertain the actual weight of the girders. The concrete in the precast prestressed concrete box girders may be denser than regular concrete and the girders contain a high percentage of reinforcing steel and stressing strands which also tend to increase the weight of the girders.

(h) No separate payment will be made for this work as it is considered incidental to the Contract Unit Price for ""Supply Precast Concrete Girders".

E26.9 Precast Prestressed Concrete Girder Quality

E26.9.1 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.

(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.

E26.9.2 Access

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

E26.9.3 Materials

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.

(c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.

E26.9.4 Quality Assurance and Quality Control

(a) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied for girder fabrication.

(b) The Fabricator shall be responsible for all Quality Control testing for all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed. Testing shall be completed by qualified personnel who are certified at the time of testing as ACI CSA-based Concrete Field Testing Technicians, Grade 1.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. The minimum quality tests is indicated below.

E26.9.5 Concrete Testing

(a) The Fabricator shall be responsible for maintaining an up-to-date record of all test results on a “Record of Concrete Strength” form and shall be approved by the Contract Administrator. A separate “Record of Concrete Strength” form shall be prepared for each girder and the strengths of the test cylinders, as well as the pertinent data, including concrete compressive strengths at destressing, yarding and twenty-eight (28) days, shall be listed in the same order as the batches of concrete were placed in the forms. A complete set of test results shall be submitted to the Contract Administrator within seven (7) days after the date that the twenty-eight (28) day cylinders from the last girder were tested. All costs involved in performing and recording the previously mentioned tests shall be the responsibility of the Fabricator.

(b) Concrete compressive strength requirements shall consist of a minimum strength, which must be attained before various loads, or stresses are applied to the concrete, with the exception of the concrete strengths for:

(i) Transfer of pre-tensioning forces;

(ii) Subjecting a member to freezing temperatures; and

(iii) Hauling and erecting a member.

(c) All concrete shall attain the minimum strength as shown on the Drawings at twenty-eight (28) days.

(d) The minimum number of test cylinders that the Fabricator shall mold from each 10 m^3 of concrete to be placed in a girder are as follows:

(i) Two (2) cylinders prior to the transfer of the pre-tensioning forces;

(ii) Three (3) cylinders for twenty-eight (28) day strength; and

(iii) Two (2) cylinders prior to the member being hauled to site and erected.

(e) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method A23.2-1C, "Sampling Plastic Concrete".

(f) All test cylinders shall be cured under the same conditions (i.e. match cured) as the girder until such time as the steam curing or moist curing of the girder has been completed.

(g) 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".

(h) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E19.4.3, “Concrete Mix Design Statement” 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.

(i) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E19.4.3, “Concrete Mix Design Statement” 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.

(j) The Fabricator shall make and test concrete cylinders that prove that the required release strength as stated on the Drawings has been attained prior to release of the stressing strand. When one or more units are cast continuously, at least two cylinders shall be taken from the concrete of the last unit poured to represent the release strength for all units. These cylinders shall be cured with the girder. Only testing of the first cylinder will be necessary if the required release strength is obtained. In the event all cylinders are tested without the required strength being obtained, the Contract Administrator shall be contacted and their acceptance obtained for the release of the units.

E26.9.6 Corrective Action

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

E26.10 Measurement and Payment

E26.10.1 Precast Prestressed Concrete Channel Girders

(a) Fabricating and supply of precast prestressed concrete channel girders shall be paid for at the Contract Unit Price per unit for “Supply Precast Prestressed Concrete Channel Girders”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials, including reinforcing, and for performing all operations herein described and all other items incidental to the Work.

(b) Erection of precast prestressed concrete channel girders shall be paid for at the Contract Unit Price per unit for “Erect Precast Prestressed Concrete Channel Girders”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials, including reinforcing, and for performing all operations herein described and all other items incidental to the Work.

(c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Supply Precast

Prestressed Concrete Girders", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E27. STEEL REINFORCED ELASTOMERIC BEARING PADS

E27.1 Description

E27.1.1 The Work under this Specification shall cover the supply and installation of steel reinforced elastomeric bridge bearing pads and their connection assemblies as shown on the Drawings.

E27.1.2 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 herein specified and as indicated on the Drawings.

E27.2 Referenced Specifications and Drawings

E27.2.1 The latest edition and all subsequent revisions of the following Standards:

(a) ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels;

(b) AWS C2.2 – Recommended Practices for Metalizing with Aluminum and Zinc for Protection of Iron and Steel;

(c) CSA-B95-1 Surface Texture (Roughness, Waviness and Lay);

(d) CAN/CSA-G40.20/21 – General Requirements for Rolled or Welded Structural Steel / Structural Quality Steel;

(e) CAN/CSA G164 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(f) CAN/CSA W48 – Filler Metals and Allied Materials for Metal Arc Welding;

(g) CAN/CSA W59 – Welded Steel Construction (metal Arc Welding) (Metric Version);

(h) CAN/CSA S6-14 – Canadian Highway Bridge Design Code;

(i) SSPC SP1 – Society for Protective Coatings: Specifications for Solvent Cleaning;

(j) SSPC SP10/NACE No. 2 – Society for Protective Coatings: Specifications for Near White Blast Cleaning; and

(k) SSPC SP11 – Society for Protective Coatings: Specifications for Power Tool Cleaning to Bare Metal.

E27.3 Scope of Work

E27.3.1 The scope of Work under this Specification shall involve:

(a) Supplying and installing steel reinforced elastomeric bearings for piers; and

(b) Supplying and installing steel reinforced elastomeric bearing pads for abutments.

E27.4 Submittals

E27.4.1 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.

E27.4.2 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 shop drawings for all bearings, top plates, retaining angles, masonry pad, and other miscellaneous metal items required for the Work. The Bearing Supplier shall provide the detailed design calculations sealed by a Professional Engineer registered in the Province of Manitoba for all of the bearings, showing that the stability, stresses on PTFE and rotational capacities meet the requirements of this Specification. The following information will also be included as part of the submission:

(i) Dimensions of each component;

(ii) Minimum and maximum horizontal and vertical load capacity, both SLS and ULS;

(iii) Longitudinal and transverse movement capacity;

(iv) Bearing rotation capacity in radians;

(v) Sketch indicating bearing locations, orientation and movement;

(vi) Installation details; and

(vii) All additional plates shown on the Drawings.

E27.5 Materials

E27.5.1 General

(a) All materials supplied under this Specification shall be of a type acceptable to 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.

E27.5.2 Steel Reinforced Elastomeric Bearings for Abutments and Piers

(a) Steel Reinforced Elastomeric Bearings shall be fabricated and supplied by the Manufacturer as shown on the Drawings.

(b) Steel reinforced elastomeric bearings shall consist of the reinforced elastomeric bearing, retaining angles, and bevelled shims.

(c) Steel Reinforced Elastomeric Bearings shall be designed and fabricated in accordance with the requirements of the latest edition of CAN/CSA CHBDC S6.

(i) Polytetraflouroethelyne (PTFE) used for bearings shall be made from virgin resin satisfying the requirements of ASTM D4895.

(ii) PTFE for steel reinforced elastomeric bearing shall be dimpled and lubricated.

(iii) Elastomer shall be natural rubber, low temperature Grade 5 with a maximum Shear Modulus of G = 1.20 MPa to satisfy the requirements outlined in Table E27-1, Physical Properties.

TABLE E27-1
PHYSICAL PROPERTIES

Property	Test	Required for Natural Rubber	Base Metal
Hardness, ºShore A	ASTM D2240	60 ± 5	
Tensile Strength, MPa	ASTM D412	Min. 17.2	
Ultimate Elongation, Percent	ASTM D412	Min. 400	
Heat Resistance	ASTM D573	70 hrs @ 70ºC	70 hrs @ 100ºC
Chance in Hardness, ºShore A		Max. +10	Max. +15
Change in Tensile Strength%		Max. -25	Max. -15
Change in Ultimate Elong. %		Max. -25	Max. -20
Compression Set, %	ASTM D395 Method B	22 hrs @70ºC, Max. 25	22 hrs @100ºC, Max. 35
Ozone Resistance	ASTM D518 Mounting Procedure A, 20% 40ºC ± 2ºC	25 pphm @ 48 hr. No cracks	50 pphm @ 100 hr. No cracks
Bond During Vulcanization, kN/m^2	ASTM D429 Method B	Min. 350	Min. 350
Brittleness @ -40ºC.	ASTM D746 Procedure B	No failure	No failure

Low Temp. Crystallization	ASTM D2240	168 hr. @ -25ºC	168 hr. @ -10ºC

(d) Steel

(i) Steel for bearings shall conform to the requirements of the latest edition of CAN/CSA G40.21, Grade 300W.

(ii) Internal steel reinforcing plates for elastomeric bearings shall conform to the requirements of the latest edition of CAN/CSA G40.21 Grade 230.

(e) Galvanizing

(i) Retaining angles and keeper plates shall be hot dip galvanized and shall be coated to a thickness of 610 g/m^2 and shall conform to the requirements of the latest edition of CAN/CSA G164.

(f) Zinc Metalizing

(i) Zinc metalizing shall be 99.9% zinc to a minimum thickness of 6 mm.

E27.5.3 Process

(a) Mould steel laminated bearing as a single unit under pressure and heat.

(b) Completely bond steel reinforcing plates on all surfaces to the elastomeric material during moulding, except that no elastomeric cover is required over internal details, i.e.: vertical holes or slots covered by bearing seats of flanges which will not be exposed to moisture after erection of the bridge. Use steel plates as indicated on the Drawings.

(c) Provide a smooth surface finish on all moulds.

(d) Fabricate internal steel plates free from sharp edges.

(e) Fabricate all internal elastomeric laminates of uniform thickness.

E27.5.4 Dimensional Tolerances

(a) Overall dimension of assembled bearings shall be ± 3 mm in plan and height.

(b) Elastomer :

(i) Thickness: -0/+3 mm

(ii) Horizontal dimensions: -0/+6 mm

(c) Thickness of individual layers of elastomer: ± 20%

(d) Edge cover of embedded steel:

(i) 3 mm minimum

(ii) 6 mm maximum

(e) When designed to be parallel, the tolerance of parallelism of any upper surface of a bearing with respect to any lower surface of the bearing, as datum, shall be 0.2% of the diameter for surfaces circular in plan and 0.2% of the longer side for surfaces rectangular in plan.

E27.5.5 Touch-Up and Field Applied Galvanizing

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(b) Approved products are:

(i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California; and

(ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161 York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E27.5.6 Welding Consumables

(a) Welding consumables for field welding shall be certified by the manufacturer as complying with the requirement of CSA Standard W59 and the following specifications:

(i) Manual shielded metal-arc welding (SMAW):

(ii) All electrodes for the manual, shielded metal-arc welding process shall conform to CSA W48.1, CSA G48.3 classification E480XX or imperial equivalent.

(iii) Gas, Metal Arc Welding (GMAW):

(iv) All electrodes used in the gas, metal arc-welding process shall be composite electrodes conforming to CSA G48.4 classification ER480S-X or imperial equivalent.

(v) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.

(vi) Submerged Arc Welding (SAW):

(vii) Welding electrodes and fluxes used in the submerged arc welding process shall conform to CSA W48.6 classification F480X-EXXX or imperial equivalent.

(b) All electrodes, wires and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -300C as outlined in the various codes mentioned above.

(c) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for his acceptance at least twenty-one (21) days prior to the scheduled commencement of any fabrication.

(d) In multiple pass welds, the weld may be deposited such that at least two layers on all surfaces and edges are deposited with one of the filler metals listed above for each particular welding process, provided the underlying layers are deposited with one of the filler metals specified in CSA Standard W59.

E27.6 Equipment

E27.6.1 General

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

E27.7 Fabrication

E27.7.1 Workmanship and finish shall be in accordance with the Drawings and Specifications and shall conform to the best practices of bridge construction. The parts shall be assembled as shown on the plans and all match marks shall be observed. The material shall be handled carefully so that no parts will be bent, broken, or otherwise damaged.

E27.8 Construction Methods

E27.8.1 General

(a) The Contractor shall submit the installation methods he intends to use to install the bearings to the Contract Administrator for acceptance at least seven (7) days prior to starting any bearing installations.

E27.8.2 Installation of Steel Reinforced Elastomeric Bearings

(a) Protect bearings from damage or distortion during handling, transport, storage, and installation and keep clean and free of all deleterious matter and contaminants including moisture and dust.

(b) Provide suitable handling devices as required. Use temporary clamping devices to maintain correct orientation of the parts during handling, transport, storage and installation but do not use for slinging or suspending bearings unless specifically designed for this purpose.

(c) Verify the condition of the bearings supplied to the site.

(d) Bearings when received by the Contractor shall be unloaded and stored in accordance with the Manufacturer's recommendations.

(e) Install bearings in the structure as specified and directed by the bearing Supplier. Do not dismantle bearings which have been pre-assembled except with the prior written approval of the supplier and the Contract Administrator. Agree to the position of any temporary packing between the outer bearing plates and the structure with the Contract Administrator.

(f) After installation leave bearings and their surrounding area clean. Remove temporary transit clamps at a time to be agreed upon by the Supplier and the Contract Administrator.

(i) Locate bearings so that their centre lines are within ± 3 mm of their correct positions. Level of a single bearing or the mean levels of more than one bearing at any support: within a tolerance of ± 0.0001 times the sum of the adjacent spans of a continuous girder but not exceeding 1 mm.

(ii) Tighten threaded fixing uniformly to avoid overstressing any part of the bearing. Supply vibration-resistant type fasteners where significant vibration may occur.

(iii) Bed bearings over their entire area. Voids or hard spots after installation are not acceptable.

(g) Upon completion of the installation, certify, in writing to the Contract Administrator, that the bearings have been correctly installed.

E27.9 Quality Control and Assurance

E27.9.1 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.

E27.9.2 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.

E27.10 Warranty

E27.10.1 Installation Warranty

(a) The General Contractor shall ensure that the steel reinforced elastomeric bearings are installed in such a manner that will not void the fabrication warranty.

(b) The Contractor shall obtain from the supplier a written warranty for the installation of the steel reinforced elastomeric bearings for a period of five (5) years from the date of issuance of the Certificate of Acceptance. Provide in the warranty for the reinstallation of the bearings at no cost to the Contractor in the event that the bearings do not perform satisfactorily in the range of design movement and under the design loads.

E27.10.2 Fabrication Warranty

(a) Before final acceptance of the steel reinforced elastomeric bearings by the Contract Administrator, the steel reinforced elastomeric bearings supplier shall provide the Contract Administrator with a written warranty stating that they will perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the issuance of the Certificate of Acceptance, provided that the steel reinforced elastomeric bearings have been properly installed. The supplier shall state that they have reviewed the installation procedures and find them in accordance with their recommendations. The Supplier shall warranty the replacement of the steel reinforced elastomeric bearings, including removal of the damaged expansion joint assembly and supply and installation of the replacement steel reinforced elastomeric bearings, at no cost to the Contractor, in the event that the bearings do not perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the issuance of the Certificate of Acceptance.

E27.11 Measurement and Payment

E27.11.1 Steel Reinforced Elastomeric Bearings

(a) Supply and installation of each individual bearing fully assembled shall be considered as one unit regardless of the bearing type, kind, size, capacity, function, or source of manufacture, Supply and installation of steel reinforced elastomeric bearing pads will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Supply and Install Steel Reinforced Elastomeric Bearing Pads", 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. Any necessary engineering and adjustment shall be considered incidental to the Work.

(b) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings to complete the installation of disc bearings shall be considered incidental to "Steel Reinforced Elastomeric Bearings", unless otherwise noted herein. No separate measurement or payment shall be made for the work associated with this Specification unless indicated otherwise.

E28. ALUMINUM PEDESTRIAN HANDRAIL/BICYCLE RAIL

E28.1 Description

E28.1.1 This Specification shall cover all operations relating to the supply and installation of the aluminum pedestrian handrail/bicycle rail as specified herein and as shown on the Drawings.

E28.1.2 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.

E28.2 References

E28.2.1 The latest edition and subsequent revisions of the following:

(a) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

(b) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;

(c) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

(d) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;

(e) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;

(f) CAN/CSA W59.2 – Welded Aluminum Construction;

(g) CAN/CSA S157 – Strength Design in Aluminum.

E28.3 Scope of Work

E28.3.1 The Work under this Specification shall involve:

(a) Supplying and installing aluminum pedestrian handrail / bicycle rail;

(b) Supplying and installing all miscellaneous steel items and other items associated with the Work.

E28.4 Submittals

E28.4.1 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.

E28.4.2 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail/bicycle rail. Fabrication shall take place as shown on the Drawings.

E28.4.3 The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in B7 and mill certificates.

E28.4.4 The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

(a) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

(b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

(c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding.

E28.5 Materials

E28.5.1 General

(a) All materials supplied under this Specification shall be of a type acceptable to 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

E28.5.2 Material for the Aluminum Pedestrian Handrail/Bicycle Rail

(a) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6).

(b) Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.

(c) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

E28.5.3 Bituminous Paint

(a) Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187. Supply of bituminous paint shall be considered incidental to the supply of aluminum pedestrian handrail.

E28.5.4 Handrail Anchorage System

(a) The handrail anchorage system is specified and paid for in accordance with E22, “Structural Concrete”.

E28.5.5 Aluminum Shims

(a) Aluminum shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the Drawings. Supply of shims will be considered incidental to the supply of aluminum pedestrian handrail.

E28.5.6 Aluminum Filler Alloys for Welded Construction

(a) Aluminum filler alloys for welded construction shall be one (1) of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654.

E28.5.7 Hinges

(a) Hinges shall be stainless steel and manufactured by Angama, Type STBB 460, or equal as approved by the Contract Administrator in accordance with B7, “Substitutes”.

E28.5.8 Equipment

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

E28.6 Construction Methods

E28.6.1 Layout

(a) Before fabrication and/or installation of the aluminum pedestrian handrail, the Contractor shall satisfy himself of all required aluminum rail and enclosure section dimensions, by field measurements.

E28.6.2 Fabrication

(a) General

(i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.

(ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.

(iii) The Fabricator shall fabricate the entire aluminum pedestrian handrail/bicycle rail in sections, to permit the installation of the rail sections onto the concrete.

(iv) The punching of identification marks on the members will not be allowed.

(v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.

(vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

(vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

(b) Sample Panel

(i) The Contractor shall be required to supply the Contract Administrator with one (1) completely fabricated handrail/bicycle rail sample panel, including at least two (2) posts, prior to proceeding with the fabrication of the remainder. The sample, once accepted, shall be identifiable for the duration of the Project, but may be incorporated into the rail system. It shall become the standard for acceptance of all aluminum pedestrian handrail/bicycle rail panels.

(c) Cutting

(i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

(d) Welding

(i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.

(ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.

(iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:

I. Guided Bend Test: All bend tests should be fully guided through an angle of 1800. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness. Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.

II. Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four (4) sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed three percent (3%) of the area under inspection.

(e) Bolting

(i) Bolt holes in 10 mm or thinner material may be drilled or punched to finished size. In material thicker than 10 mm, the holes shall be drilled to finished size or subpunched smaller than the normal diameter of the fastener and reamed to size.

(ii) The finished diameter of the holes shall be not more than seven percent (7%) greater than the nominal diameter of the fastener, except:

I. Slotted holes for expansion purposes shall be provided as required on the Drawings.

II. Holes for anchor bolts may be up to 50 percent greater than the nominal bolt diameter with a maximum of 13 mm greater than the nominal bolt diameter.

III. Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.

IV. In all bolts, the finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are tightened.

E28.6.3 Installation of Aluminum Pedestrian Handrail/Bicycle Rail

(a) The aluminum pedestrian handrail/bicycle shall be brought on-site and accurately installed as shown on the Drawings.

(b) The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.

(c) The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted. The Contractor shall report to the Contract Administrator any corrective measures.

(d) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The surface of the bottom shim that is in contact with concrete shall be separated with a minimum of two (2) coats of bituminous paint. A minimum 3 mm aluminum shim shall be installed under each post.

E28.7 Quality Control and Assurance

E28.7.1 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.

E28.7.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, 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 or by the Testing Laboratory designated 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.

E28.8 Measurement and Payment

E28.8.1 Aluminum Pedestrian Handrail/Bicycle Rail

(a) Supplying and installing the aluminum pedestrian handrail/bicycle rail will be measured on a length basis and paid for at the Contract Unit Price per metre for "Supply and Install Aluminum Pedestrian Handrail/Bicycle Rail", which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

E29. BRIDGE ALUMINUM BARRIER RAIL

E29.1 Description

E29.1.1 This Specification shall amend and supplement City of Winnipeg Specification CW 3650 and cover all operations relating to the bridge aluminum barrier rails.

E29.1.2 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.

E29.2 References

E29.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) City of Winnipeg Specification CW 3650.

E29.3 Scope of Work:

E29.3.1 The Work under this Specification shall involve:

(a) Supply and installation of the bridge aluminum barrier rails and posts on the new concrete traffic barriers;

(b) Supply and installation of the anchors for the bridge aluminum barrier posts on the concrete traffic barriers.

E29.4 Submittals

E29.4.1 At least fourteen (14) days prior to the scheduled commencement of any fabrication, the qualifications of Contractor, the qualifications of operator, the shop drawings, mill certificates, welding procedures, and welding consumable certificates shall be submitted to the Contract Administrator for acceptance.

E29.4.2 The shop drawings shall clearly show shapes, dimensions, detail, connection (including proper CSA welding identification), bolt holes, and accessories.

E29.5 Materials

E29.5.1 Rail posts for the aluminum barrier rail on the concrete traffic barriers shall be fabricated in accordance with the Drawings and E21.

E29.5.2 The anchors for the aluminum balance barrier on the concrete traffic barriers shall be in accordance with the Drawings and E21.

E29.5.3 Zinc for hot dipped, galvanized coatings shall conform to the requirements of ASTM A123.

E29.5.4 Stainless steel bolts, nuts, washers, inserts, and the like as shown on the Drawings shall conform to the requirements of ASTM A320, Grade B8, Class 2.

E29.6 Equipment

E29.6.1 General

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

E29.7 Quality Control and Assurance

E29.7.1 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.

E29.7.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, 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.

E29.8 Measurement and Payment

E29.8.1 Supplying and installing the bridge aluminum barrier rail will be measured on a length basis and paid for at the Contract Unit Price per linear metre for “Supply and Install Bridge Aluminum Barrier Rail”, measured as specified herein, 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, accepted and measured by the Contract Administrator.

E29.8.2 Supplying and installing the bridge aluminum barrier posts and anchors will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Supply and Install Bridge Aluminum Barrier Posts”, measured as specified herein, 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, accepted and measured by the Contract Administrator.

E30. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

E30.1 Description

E30.1.1 This Specification shall cover the supply of labour, equipment, tools, and material necessary for the application of hot poured rubberized asphalt waterproofing on the bridge deck and approach slabs as specified herein and as shown on the Drawings.

E30.1.2 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.

E30.2 References

E30.2.1 The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards:

(a) CAN/CGSB-27.9M – Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing;

(b) CGSB-37-GP-50M – Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(c) CGSB-37-GP-51M – Application of Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(d) CGSB-37-GP-56M – Membrane, Bituminous, Prefabricated and Reinforced for Rooting.

E30.3 Scope of Work

E30.3.1 The Work under this Specification shall involve:

(a) Preparing the concrete to receive the waterproofing membrane;

(b) Applying primer to the concrete;

(c) Placing the asphalt waterproofing membrane on the concrete deck;

(d) Placing polyester fabric protection layers and protection board, as shown on the Drawings;

(e) Submittals

E30.3.2 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, a proposed schedule, including methods and sequence of operations.

E30.3.3 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.

E30.4 Materials

E30.4.1 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.

(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.

E30.4.2 Hot Poured Rubberized Asphalt Waterproofing

(a) The hot poured rubberized asphalt waterproofing system shall consist of the following compounds:

(i) Primer;
(ii) Hot applied rubberized asphalt waterproofing membrane;
(iii) Polyester fabric;
(iv) Protection board.

(b) The hot poured rubberized asphalt waterproofing membrane shall be a two (2) layer, fabric-reinforced system. Each layer shall be 2.0 to 3.0 mm in thickness. The intermediate fabric reinforcement shall be placed between the layers.

(c) The Contractor shall supply and install approved protection board to cover the hot poured rubberized asphalt waterproofing membrane.

E30.4.3 Primer

(a) The entire concrete surface to be waterproofed shall receive a prime coat conforming to the requirements of dampproofing / waterproofing primer CGSB37-GP-9Ma, 930-18 (BAKOR) or approved equivalent in accordance with in accordance with B7, at an application rate in accordance with the Manufacturer's recommended methods.

(b) Primer shall be stored at temperatures of 5°C and above to facilitate handling. Materials shall be stored in a dry location and shall be kept in an upright position.

E30.4.4 Hot Poured Rubberized Asphalt Waterproofing Membrane (Two (2) layers)

(a) The hot poured rubberized asphalt waterproofing membrane shall be Bemalastic 1213 BDM by McAsphalt or 790-11 by BAKOR, or an approved equivalent, in accordance with B7.

(b) The waterproofing membrane shall be melted, mixed, and applied according to the Manufacturer's recommendations.

(c) The layering operation shall be such that the waterproofing membrane is applied in two (2) 2.0 mm – 3.0 mm thick layers.

(d) Discontinuities in the waterproofing membrane shall be avoided and joints lapped a minimum of 150 mm. The waterproofing membrane shall be applied to the entire bridge deck and approach slab and shall extend up the face of the barriers to the top (proposed elevation) of the asphalt pavement.

(e) At the Contract Administrator's discretion, samples from the kettles shall be tested by the Contractor.

E30.4.5 Polyester Fabric

(a) An intermediate reinforcing layer shall be placed between the layers of waterproofing membrane. The intermediate reinforcing layer shall be spun-bonded polyester fabric such as Reemay 2016 grade, BAKOR Polyester Fabric Reinforcing Sheet, McAsphalt Fabric Reinforcement BP-16 or approved equivalent in accordance with B7, and set into the first layer of waterproofing membrane to achieve a minimum of fifty percent (50%) bleed through. Maximum overlap or gap between sheets of 6 mm.

E30.4.6 Protection Board

(a) The protection board shall be a durable panel of 3 mm thickness specifically designed to provide a protective cushion between the hot mix asphalt pavement and the hot-applied rubberized asphalt waterproofing membrane for bridges and shall be approved by the Contract Administrator.

(b) The protection board shall be BAKOR Asphalt Protection Board, McAsphalt Protection Board BP-Asp PB, or approved equivalent in accordance with B7.

(c) The protection boards shall be placed on top of the upper layer of waterproofing and rolled by means of a linoleum or lawn type roller while the membrane is still warm to ensure good contact with the membrane. The protection boards shall be placed with edges overlapping 25 mm both longitudinally and transversely. The protection board's edge shall be within 5 mm of all barriers. Protection boards shall be placed such that the longitudinal (direction of traffic) joints are staggered at least 150 mm. Instances

where edges of the protection board curl up, the edges shall be cemented down using asphalt waterproofing. Protection boards that are warped, distorted, or damaged in any way shall be rejected.

E30.4.7 Surface Conditioner

(a) Surface conditioner shall be applied to the concrete surfaces of the bridge deck, and approach slab and shall conform to the Manufacturer's recommended methods.

E30.5 Equipment

E30.5.1 General

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

E30.6 Construction Methods

E30.6.1 General

(a) No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

(b) Temporary protection of the membrane shall be provided to prevent mechanical damage or damage from spillage of oil or solvents until such time as permanent protection is provided.

E30.6.2 Melting On-Site

(a) Cakes of rubberized asphalt waterproofing shall be melted in an approved double shell melter under continuous agitation until the material can be drawn free flowing and lump free from the melter.

(b) The temperature of the rubberized asphalt waterproofing shall not exceed two hundred and eighteen degrees Celsius (218°C) at any time during the entire melting procedure.

E30.6.3 Application

(a) 1.2 thick by 300 mm wide butyl rubber shall be placed as shown in the Drawings over construction joints on the underpass roof prior to placement of waterproofing membrane in accordance with the Manufacturer's requirements.

(b) The entire concrete surface area onto which the hot poured rubberized asphalt waterproofing is to be applied shall be thoroughly cleaned by means of sand blasting. The sand blasted surfaces shall be sound, free from curing compounds, laitance, and scaling. All rough spots, ridges and edges in the concrete surface resulting from protrusions of concrete aggregate or cement paste shall be removed by light chipping or grinding to leave a smooth and level surface. Immediately prior to the application of the hot poured rubberized asphalt waterproofing, a final cleaning of the concrete surfaces shall be done using high velocity compressed air. The concrete surfaces shall be dry, clean, and free from frost, dust, dirt, and all foreign matter. The Contractor shall contain and collect all products of the sand blasting operation including dust, debris, and spent abrasive so as to ensure that all of these materials are prevented from entering into surrounding area. All debris and spent abrasive shall be collected and disposed of off-site by the Contractor at a proper disposal facility. The Contractor is responsible for the preparation of the concrete surfaces to ensure that the hot-poured rubberized asphalt waterproofing can be installed in accordance with the Manufacturer's requirements.

(c) The Contractor shall ensure that the concrete surfaces onto which the hot poured rubberized asphalt waterproofing is to be applied is prepared (including supply and application or waterproofing primer) to the degree that the hot poured rubberized asphalt waterproofing can be installed in accordance with the Manufacturer's requirements.

(d) After the concrete deck and approach slab have been cleaned, they shall be covered with surface conditioner. The quantity used shall be 160 mL/m^2, or as recommended by the Manufacturer. The surface conditioner shall be allowed to dry before the application of the rubberized asphalt waterproofing.

(e) The primer shall be applied at a uniform rate, as recommended by the Manufacturer, avoiding over-spraying or ponding of material. The primer shall be dry before applying the rubberized asphalt waterproofing.

(f) The rubberized asphalt waterproofing shall be brought to a temperature of between 190^{o}C and 218^{o}C.

(g) The application of the rubberized asphalt waterproofing shall be carried out under the supervision of experienced personnel.

(h) Apply membrane in a smooth fashion, free from air pockets, wrinkles, or tears, and in accordance with the Manufacturer's recommended methods. Ensure full bond of membrane to substrate.

(i) Apply the first layer of hot rubberized asphalt membrane evenly to a minimum thickness of 2 mm to form a continuous monolithic coating over horizontal and vertical surfaces.

(j) Apply fabric reinforcing sheet and firmly press into first layer of hot membrane. Overlap fabric approximately 6 mm ensuring that a layer of membrane is present between overlaps. Apply a second layer of membrane over the fabric to a minimum thickness of 3 mm.

(k) The Contractor shall supply and install an elastomeric sheet membrane which is compatible with the hot-poured rubberized asphalt waterproofing material. The elastomeric sheet membrane shall be installed at the designated locations shown on the Drawings. Installation of the heavy-duty elastomeric sheet membrane shall be in accordance with the Manufacturer's recommendations.

(l) Protection course shall be rolled onto hot applied rubberized asphalt membrane surface while still warm and tacky.

(m) Lap protection course shall be 50 mm on side laps and 150 mm on end laps, staggering laps.

E30.7 Quality Control and Assurance

E30.7.1 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.

E30.7.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, 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.

E30.8 Measurement and Payment

E30.8.1 Hot-Poured Rubberized Asphalt Waterproofing

(a) Hot-poured rubberized asphalt waterproofing with protection board shall be measured on a area basis and paid for at the Contract Unit Price per square meter 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 includes in this Specification, accepted and measured by the Contract Administrator.

(b) Items of Work:

Hot-Poured Rubberized Asphalt Waterproofing

(i) Bridge Deck

(ii) Approach Slabs

E31. ASPHALTIC CONCRETE PAVING ON BRIDGE AND APPROACH SLABS

E31.1 Description

E31.1.1 This Specification shall cover all operations relating to the supply of labour, equipment, tools and material necessary for the application of tack coat and the placing and compaction of the asphaltic hot mix overlay on the bridge deck mainline and shoulders. The thickness of the overlay shall be as specified on the Drawings.

E31.1.2 The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, handling and storage, and all things necessary for and incidental to the satisfactory performance and completion of all Work as herein specified and as indicated on the Drawings.

E31.2 References

E31.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Specification E30, Hot-Poured Rubberized Asphalt Waterproofing

(b) Specification CW 3410 - Asphaltic Concrete Pavement Works

E31.3 Scope of Work

E31.3.1 The Work under this Specification shall include:

(a) Surface preparation of the bridge deck and approach slabs;

(b) Supplying and applying the tack coat;

(c) Supplying, hauling, placing and compacting of asphaltic hot mix (overlay) on the bridge deck and approach slabs, including all work at the joints;

(d) The quality control (QC) testing of all materials.

E31.4 Submittals

E31.4.1 In addition to Specification CW 3410 - Asphaltic Concrete Pavement Works, the Contractor shall submit the proposed mix design and test results to the Contract Administrator fourteen (14) days prior to the Work for verification and approval.

E31.5 Materials

E31.5.1 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.

E31.5.2 Tack Coat and Bituminous Pavement

(a) The tack coat and bituminous pavement for the class specified on the Drawings shall conform to the requirements of the Specification CW 3410-R12 - Asphaltic Concrete Pavement Works.

(b) Asphalt shall be Type 1A.

E31.5.3 Caulking Compound and Miscellaneous Joint Materials

(a) Caulking compound and miscellaneous joint materials shall be as shown on the Drawings or approved by the Contract Administrator.

E31.6 Equipment

E31.6.1 General

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

E31.7 Construction Methods

E31.7.1 Surface Preparation

(a) Surfaces to receive asphalt concrete paving shall be thoroughly cleaned by means of a power broom and compressed air. All surfaces to which the tack coat is to be applied shall be dry and fee from scale, dirt, grime, grease, oil or other contaminants.

E31.7.2 Application of Tack Coat

(a) Tack coat shall be applied to the entire surface of the deck and approach slabs. The quantity used shall not exceed 550 mL/m2. Curbs and all other like appurtenances having a vertical face shall receive a brushed-on application of tack coat to the height of the compacted asphalt mat. All puddles or other excess of the tack coat shall be thoroughly spread out by brushing the material over the surrounding surface.

(b) The vertical surfaces of the curbs and all other like appurtenances and the bridge deck areas within one (1) foot of such abutting surfaces, shall receive a further coating of paving grade (150/200 penetration) asphalt cement.

(c) The treated surface shall be allowed to cure until it becomes tacky before applying the asphalt mix.

E31.7.3 Distribution

(a) The distributor used in applying the liquid bituminous tack coat shall be of a type, size and equipped as to meet the following requirements:

(i) It shall be capable of applying bituminous tack coat on the deck and approach slabs in accurately measured quantities.

(ii) It shall be equipped with:

I. A heating unit capable of maintaining the asphalt in the tank at the specified temperature;

II. A thermometer so placed as to accurately measure the temperature of the material in the tank;

III. A tachometer operated by an independent wheel, or a similar suitable device, that will allow the operator to determine the correct travel speed for applying the specified quantity of asphaltic material;

IV. A pressure gauge to indicate to the operator that the required nozzle pressure is being maintained;

V. Spray nozzles, with quick acting positive shutoff, of a design which will ensure a uniform fan-shaped spray;

VI. A strainer on the discharge line to prevent clogging;

VII. A spray bar of adjustable length that can be raised or lowered;

VIII. A spray bar having a heating device, asphalt circulation system, or other device which will provide a uniform viscosity of material in all portions of the spray bar; and

IX. A hose and nozzle attachment to be used for spraying, by hand, areas inaccessible to the distributor spray bar.

(iii) On smaller bridge decks and approach slabs, the use of manual spraying equipment suitable for applying the liquid bituminous material uniformly at the desired rate will be allowed.

E31.7.4 Transportation of Bituminous Pavement Mixture

(a) The mixture shall be transported from the mixing plant to the job site in vehicles with tight boxes having metal bottoms previously cleaned of all foreign materials. When directed by the Contract Administrator, the vehicles shall be suitably insulated. Each vehicle shall be equipped with a closely fitting tarpaulin of canvas or other suitable material of sufficient size to overhang the truck box on all sides when the vehicle is loaded. Tarpaulins shall be used to completely cover the mixture at all times, even during the placing of the load into the spreader.

(b) All loads not properly covered will be rejected.

E31.7.5 Placing Asphaltic Concrete Paving Mixture - Mainline

(a) The Contractor shall spread the asphalt pavement mixture by means of two simultaneous self- propelled mechanical paver complete with screed. The paver shall be equipped with both automatic and manual controls capable of adjusting the screed to produce the required profile, cross section and longitudinal joint matching. Unless otherwise permitted the paver shall be operated using automatic controls. The automatic control of profile shall be accomplished by reference to a floating beam or skid. The beam or skid shall have a minimum length of 9 metres. A floating beam shall be supported by wheels or skis in a floating tandem arrangement. The number and arrangement of wheels or skis and the nature of the beam or skid shall be subject to the Contract Administrator's approval. When paving adjacent to a newly laid lane on final lift or adjacent to a curb, control of profile may be accomplished by reference to a shoe on the adjacent final lift or curb.

(b) The paver shall produce a uniformly textured surface free from tearing, tracking or other objectionable surface irregularities. If the surface condition is not acceptable, spreading operations shall cease until equipment adjustments, repairs or replacement are made. Spreading operations shall not recommence without the approval of the Contract Administrator. Delays and expense entailed in adjustments, repairs or replacement of equipment shall be the responsibility of the Contractor.

(c) The paver shall proceed in the same direction as the lap of the protection board and the sequence of spreading operations with respect to lanes and lifts shall be approved by the Contract Administrator.

(d) The spreader shall be capable of spreading the mixture true to the elevations, grades and crown as shown on the Drawings. The allowable variation in the bituminous pavement surface shall not exceed 6 mm when measured using a 3 meter straight edge. Particular attention shall be paid to the setting of the

(e) spreader when laying the mixture in the areas adjacent to protruding joints in order to avoid bumps in the areas of such joints. In correcting the areas adjacent to a joint or when removing excess mixture, the material shall be picked up and not cast on the surface of the freshly spread bituminous pavement.

(f) Immediately after the course is screeded, and before roller compaction is started, the remainder of the surface shall be checked, all inequalities adjusted, and all high spots removed and replaced with satisfactory material. Irregularities in alignment and grade along the curb shall be corrected by the addition or removal of mixture before the edge is rolled.

(g) The speed of the spreader shall be maintained at a uniform rate that is in balance with the amount of bituminous pavement mixture being delivered to the bridge site.

(h) The Contractor shall apply a tack coat between successive lifts as approved by the Contract Administrator.

E31.7.6 Compaction of Asphalt Overlay Mixture

(a) The breakdown and finishing operations shall be carried out by a steel three (3)-wheeled or tandem roller. The intermediate rolling shall be done by a self- propelled pneumatic-type roller. Delays in rolling freshly-spread mixture will not be tolerated.

(b) All areas next to vertical curb median faces and protruding deck joints shall be worked with hot iron tampers, mechanical vibratory tempers or by other means satisfactory to the Contract Administrator.

E31.7.7 Construction Joints in Asphalt Overlay

(a) Longitudinal and transverse joints shall be made in a careful manner in order to assure a well-bonded, sealed and level joint. A transverse joint shall be cut back to its full depth perpendicular to the mat at the end of the run. On resuming laying of the paving mixture, the exposed edges shall be painted with a thin coat of hot asphalt cement.

(b) Before placing the paving mixture against them, all contact surfaces of longitudinal joints, curbs, leaders, etc., shall be painted with a thin coat of hat asphalt cement, as well as heated with a propane joint heater.

(c) The allowable variation in the surface across a transverse joint shall not exceed 6 mm when measured using a 3 m straight edge centred on the joint.

(d) In raking joints, excess mix material shall be picked up and removed from the surface of the freshly spread asphalt.

E31.7.8 Joints in Asphalt Overlay

(a) When called for on the Drawings, the Contractor shall, after the completion of the asphalt paving, saw-cut the asphalt in the transverse direction for the full roadway width at every pier and abutment to the dimensions as shown on the Drawings. The joints shall then be constructed in accordance with the Drawings.

E31.7.9 Weather

(a) Paving asphalt to be laid to a compacted thickness of less than 40 mm shall not be started unless the air temperature is at least ten degrees Celsius (10°C) and rising, and not until all frost or moisture has evaporated to leave a dry surface. For greater thicknesses of asphalt pavement, the temperature requirement may be reduced to five degrees Celsius (5°C), providing the temperature is rising.

E31.7.10 Protection of Exposed Bridge Surfaces

(a) Utmost care shall be taken to prevent the surfaces of the curbs above the compacted asphalt mat, as well as the newel posts and approach railing, from being disfigured by materials such as tack coating, caulking compound, cement and asphalt mixture.

(b) If the exposed surfaces are marred as a result of the Contractor's operations, restoration shall be made by the Contractor at his expense and to the satisfaction of the Contract Administrator.

E31.8 Quality Control and Quality Assurance

E31.8.1 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 quality control testing by the Contractor shall meet the requirements specified in the Specification CW 3410-R12 - Asphaltic Concrete Pavement Works.

E31.8.2 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) The Contractor shall take random field samples and conduct quality assurance tests on the materials, including the asphalt hot mix as directed by the Contract Administrator. If any material or the asphalt hot mix is proven to be of inferior quality, the Contract Administrator will reject such material.

(e) In cases where bituminous pavements have already been laid and are proven in later tests to be inferior, the Contractor shall remove such material and replace it with proper material at his own expense.

E31.9 Measurement and Payment

E31.9.1 Asphalt paving will be measured on a weight basis and paid for at the Contract Unit Price per tonne 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.

E31.9.2 Items of Work:

(a) Asphalt Overlay on Bridge and Approach Slabs

(b) Mainline

(c) Shoulder

E32. DESIGN, SUPPLY AND INSTALLATION OF GABIONS

E32.1 Description

E32.1.1 This Specification shall cover the design and supply of all material, labour, plant, and equipment required to furnish, assemble, and fill woven wire mesh gabions and gabion

mats with rock as specified in the Contract to the dimensions, lines and grades shown on the Drawings.

E32.2 Materials

E32.2.1 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.

E32.2.2 Gabion Crushed Limestone Base

(a) Base course material for the gabion base shall be a well graded crushed limestone conforming to the latest edition of CW 3110 amended as follows:

(i) Crushed limestone when subjected to the Los Angeles abrasion test shall have a loss of not more than thirty-two percent (32%).

(ii) Crushed limestone when subjected to the Magnesium Sulphate Soundness test shall have a loss of not more than thirteen percent (13%).

(b) The sample material shall be crushed to 37.5 mm maximum aggregate size and tested in accordance with ASTM C131 - Resistance to Degradation of Small Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine and ASTM C88 - Soundness of Aggregates by Use of Magnesium Sulphate.

(c) Supply and installation of crushed limestone base will be considered incidental to Supply and Installation of Gabions, and no separate payment will be made.

E32.2.3 Gabions

(a) Wire Mesh

(i) The wire for wire mesh, selvage wire, lacing wire, and internal connections shall be galvanized wire, soft temper, Class 3 coating, according to ASTM A 641. The wire diameter shall be according to Table 4. The tensile strength of the wire shall be according to ASTM A 641 as tested according to ASTM A370. Galvanizing on the wire shall meet the requirements of Table 4 as tested according to ASTM A 90M.

(b) PVC Coating

(i) PVC coating shall be according to ASTM A 975 and shall have a minimum thickness of 0.38 mm with a nominal thickness of 0.50 mm. Prior to UV and abrasion degradation, the PVC polymer coating shall have a projected durability life of 60 years as tested according to UL 746B.

(c) Fasteners

(i) Fasteners shall be fabricated such that when the ends of the fastener are brought together and properly locked, the fastener forms a closed loop. The inside area of the closed loop shall be at least 325 mm2 to enclose up to four selvage wires.

(ii) Locked fasteners shall be able to resist a minimum direct force across any axis of 3 kN while remaining closed and locked.

(d) Stainless Steel Rings

(i) Stainless steel rings shall be manufactured from 3 mm diameter stainless steel spring wire Type 302, Class 1, according to ASTM A 313M.

(e) Interlocking Wire Fasteners

(i) Interlocking fasteners shall be manufactured from 3 mm diameter steel mechanical spring wire Class 1, Finish 2, Type B, Tensile Class 2, according to ASTM A 764.

E32.2.4 Gabion Production

(a) General

(i) Gabion baskets and gabion mats shall be manufactured so that the sides, ends, lid, base, and diaphragms can be readily assembled into rectangular units.

(ii) Where the length of the gabion basket exceeds its horizontal width, the gabion basket shall be divided into equal cells by diaphragms. Cell length shall not exceed its horizontal width. Diaphragms shall be made of wire mesh and shall be secured in the proper position on the base section. Gabion mats shall have diaphragms spaced at 1.0 m across the width of the mat and 3.0 m along the length of the mat.

(iii) Gabion baskets or gabion mats shall be manufactured with all components connected at the production facility with the exception of the gabion mat lid. Gabion baskets manufactured from galvanized wire mesh shall be assembled using either lacing wire or fasteners. Gabion baskets and gabion mats manufactured from PVC coated galvanized wire mesh shall be assembled using stainless steel ring fasteners. Fasteners shall be installed at a maximum spacing of 150 mm with at least one fastener per gabion mesh opening.

(b) Dimensions and Tolerances

(i) Gabion baskets and gabion mats shall be produced to the sizes and dimensions shown in Tables 1 and 2. All dimensions are subject to a tolerance limit of ± 5%, except depth dimensions, which are subject to tolerance limit of ± 5% for gabion baskets and ± 10% for gabion mats.

(c) Packaging and Marking

(i) Each gabion basket and gabion mat shall be clearly colour coded or suitably identified to indicate its size.

(ii) Gabion baskets shall be shipped folded flat in bundles. Each bundle shall contain an equal number of one size of gabion baskets, except as necessary to complete an order. Each bundle shall be clearly marked to show the size and number of baskets it contains. The maximum weight of one bundle shall be 850 kg.

(iii) Gabion mats shall be shipped in rolls with ends, sides, and dividers attached to the base. The gabion mat lid and base units are to be shipped unattached, but rolled together as one. The maximum weight of one roll shall be 850 kg.

TABLE E32.1 – MINIMUM REQUIREMENTS OF MESH AND CONNECTIONS

Test Description	Galvanized Gabion Basket	PVC Coated	
		Gabion Basket	Gabion Mat
Parallel to Twist	51.1 kN/m	42.3 kN/m	33.6 kN/m
Perpendicular to Twist	26.3 kN/m	20.4 kN/m	13.1 kN/m
Connection to Selvages	20.4 kN/m	17.5 kN/m	10.2 kN/m
Panel to Panel Connection Using Lacing Wire or Fasteners	20.4 kN/m	17.5 kN/m	10.2 kN/m
Punch Test	26.7 kN	23.5 kN	17.8 kN

TABLE E32.2 – GABION BASKETS AND GABION MATS

	Galvanized Gabion Basket	PVC Coated	
		Gabion Basket	Gabion Mat
Mesh Type	80 x 100 mm	80 x 100 mm	80 x 100 mm
Mesh Opening	83 x 114 mm	83 x 114 mm	83 x 114 mm
Wire Diameter for Mesh	2.95 mm	2.70 mm	2.20 mm
Wire Diameter for Selvages and Corners	3.85 mm	3.40 mm	2.65 mm
Wire Diameter for Lacing and Internal Connections	2.20 mm	2.20 mm	2.20 mm
Galvanizing for Mesh Wire	244 g/m^2 min	244 g/m^2 min	213 g/m^2 min
Galvanizing for Selvage Wire	274 g/m^2 min	260 g/m^2 min	244 g/m^2 min
Galvanizing for Lacing Wire	213 g/m^2 min	213 g/m^2 min	213 g/m^2 min

E32.2.5 Stone fill:

(a) Hard, durable, and abrasion resistant such that it will not disintegrate from action of wetting and drying, wave action, freezing and thawing cycles

(b) Minimum 100 mm to maximum 200 mm dimension for individual stones.

(c) The Contractor shall submit samples of the stone fill for approval by the Contract Administrator.

E32.2.6 Geotextile

(a) Geotextile shall be Separation/Reinforcement Geotextile Fabric in accordance with CW 3130-R4.

(b) Supply and installation of geotextile fabric will be considered incidental to Supply and Installation of Gabions, and no separate payment will be made.

E32.3 Equipment

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

E32.4 Construction Methods

E32.5 This specification shall provide a general summary of assembly and installation procedures for PVC coated gabions. The Contractor shall reference the construction drawings as well as the manufacturer's product installation manual(s) for further details on proper gabion assembly and installation.

E32.5.1 Site Preparation

(a) Prior to assembly and installation of the gabions, the following base preparation shall be completed:

(i) Compact subgrade conforming to CW 3110-R17.

(ii) Install and compact the base course material conforming to CW 3110-R17.

E32.5.2 Assembly of Gabions

(a) Gabions shall be installed in the locations and to the line, grade, and dimensions specified in the Contract Documents.

(b) Gabions shall be assembled according to the manufacturer's instructions and as specified in the Contract Documents.

(c) Gabions shall be assembled so that wire ends do not project outside the units on any exposed surface.

(d) Gabion stones shall be placed in a manner as not to damage the wire mesh or the PVC coating on the wire or cause deformation of the gabion. Gabion stones shall be placed to minimize the voids between the stones. When specified in the Contract Documents, the front face of exposed wall surfaces shall be hand placed gabion stone to ensure a uniform appearance.

(e) Prior to securing the lids on the gabion baskets, the gabion basket shall be slightly overfilled by 25 to 50 mm of gabion stone in order to allow for settlement of the stone within the units.

E32.5.3 Placing of Internal Connecting Wires

(a) Internal connecting wires shall be installed according to the manufacturer's recommendations. Where gabions are used as a channelling revetment, internal connecting wires are not necessary.

E32.5.4 Securing Lids

(a) When the gabion has been filled, the gabion lid shall be bent over until all lid edges coincide with the front and side edges of the gabion and shall be secured to the front and sides by wire according to manufacturer's instructions.

E32.5.5 Geotextile

(a) Geotextile shall be placed uniformly, free of tears, in accordance with CW 3130- R4 and to the limits shown on the Drawings. Geotextile shall be fixed to prevent movement during installation.

E32.6 Quality Control and Assurance

E32.6.1 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.

E32.6.2 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.

E32.7 Measurement and Payment

(a) The design, supply and installation of all crushed limestone base, geotextile, gabion baskets and stone fill as shown on the Drawings will not be measured and paid for at the Contract Lump Sum Price for "Design, Supply and Installation of Gabions" which price shall be payment in full for all design of gabion walls, supplying all materials, and for performing all operations herein described and all other items incidental to the Work included in this Specification, accepted by the Contract Administrator.

ROADWORKS

E33. EXCAVATION

E33.1 Description

E33.1.1 This Specification shall cover all operations relating to Excavation.

E33.1.2 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.

E33.2 References

E33.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) This specification shall supplement and amend:

(i) CW 3110-R22.

E33.3 Materials

E33.3.1 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.

E33.4 Equipment

E33.4.1 General

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

E33.5 Construction Methods

E33.5.1 Excavation shall be completed in accordance with CW 3110-22.

E33.5.2 Excavation shall include the following items:

(a) Bench cuts which consist of excavating horizontal cuts into existing slopes. Bench cuts shall be made at vertical intervals of 1.0 m with the initial base cut being 0,.5 m

above the toe of the existing slope. The base of each bench cut shall extend into the existing slope a minimum of 2 m. Suitable material resulting from the bench cut shall be incorporated and compacted into the new embankment. Unsuitable material shall be disposed of.

(b) Stripping topsoil and vegetation.

E33.6 Quality Control and Assurance

E33.6.1 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.

E33.6.2 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.

E33.7 Measurement and Payment

E33.7.1 Excavation

(a) Excavation shall be measured and paid for in accordance with CW 3110-R22.

(b) No separate payment will be made for stripping topsoil and vegetation. Measurement will be included in measurements made for “Excavation”.

(c) No separate measurement or payment will be made for bench cuts. This will be included in payment for “Excavation”.

E34. CONCRETE TRANSITION CURB

E34.1 Description

E34.1.1 This Specification shall supplement and amend CW 3310-R18 – “Portland Cement Concrete Pavement Works”.

E34.1.2 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 an incidental to the satisfactory performance and completion of all work hereinafter specified.

E34.2 Materials

E34.2.1 General

(a) All materials shall be as specified in CW 3310-R18.

(b) 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.

(c) 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.

E34.3 Equipment

E34.3.1 General

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

E34.4 Construction Methods

E34.4.1 Concrete Transition Curb

(a) Concrete transition curb shall be constructed to the dimensions and at the locations shown on the Drawings.

(b) Reinforcing steel shall be installed as per the Drawings or as directed by the Contract Administrator.

E34.5 Quality Control and Assurance

E34.5.1 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.

E34.5.2 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.

E34.6 Measurement and Payment

E34.6.1 Concrete Transition Curb

(a) Concrete transition curb will be measured on a length basis and paid for at the Contract Unit Price for the "Items of Work" listed here below. The length to be paid for will be the total number of meters installed in accordance with this Specification, accepted and measured by the Contract Administrator.

(b) Items of Work

(i) Concrete Pavements, Median Slabs, Bull-noses, and Safety Medians

(ii) Type 1 Concrete Transition Curb

(c) Supply and installation of reinforcing steel shall not be measured and shall be considered incidental to "Concrete Transition Curb".

E35. INSTALLATION OF CULVERTS

E35.1 Description

E35.1.1 General

(a) This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3610-R3 "Installation of Culverts", and shall cover supply and installation of culverts.

(b) Referenced Standard Construction Specifications

(i) CW 2030 – Excavation Bedding and Backfill

(ii) CW 3610 – Installation of Culverts

(c) Referenced Standard Detail

(i) SD 002 – Standard Trench and Excavation Backfill Classes.

E35.2 Materials

E35.2.1 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.

E35.2.2 Bedding and Backfill

(a) Bedding and initial backfill material shall consist of 20 mm limestone base, as specified in CW 2030, placed on a prepared subgrade and compacted to the thickness and density herein specified.

E35.3 Equipment

E35.3.1 General

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

E35.4 Construction Methods

E35.4.1 Beveled Ends

(a) Further to CW 3610, all CSP culvert ends shall be beveled as shown on the Drawings.

E35.4.2 Bedding and Backfill

(a) The backfilling for corrugated steel pipe installed under proposed pavements and private approaches shall be Class 2 as shown in Standard Detail SD-002 and specified in CW 2030, except as noted below.

(b) The following revisions for bedding and initial backfill apply to Class 2 and Class 4 backfill:

(i) Limestone base course material as previously specified shall be used for bedding and initial backfill as opposed to sand.

(ii) A minimum thickness of 225 mm of compacted 20 mm limestone bedding shall be placed on the prepared subgrade. A 75 mm blanket of loose uniform bedding material shall then be placed on the compacted bedding to provide fill for the corrugations in the invert.

(iii) The backfill material shall be placed in layers not exceeding 300 mm. Backfilling shall be carried out in such a manner as to obtain uniform compaction without soft spots. Compaction shall be 95% of the Standard Proctor Density.

(iv) Manual placing and compaction of material shall be used to build up the backfill to encompass the lower part of the pipe. Backfill material shall be placed under the haunches by shovel and compacted firmly by power compaction ("jumping jack") equipment. Valleys of the corrugations and the area immediately next to the pipe must be compacted by hand operated methods. At no time shall heavy compaction equipment be brought closer than 1 m from the CSP.

(v) Backfill shall be so placed and mechanically compacted that the fill rises equally and simultaneously on both sides, including handwork next to the pipe. Layers shall be placed with equipment running parallel to the structure.

(vi) When the fill on both sides of the pipe approaches the crown of the pipe, the same techniques of spreading shallow layers and compacting thoroughly shall be followed as the backfill covers the pipe. Light tamping equipment shall be used for the initial layers over the pipe.

(vii) No distortion of the structure greater than 2% of the span or rise shall be allowed.

(viii) No traffic of any sort shall be permitted over the structure until cover of a minimum depth of 300 mm is properly compacted in place.

(ix) All compaction equipment used shall be subject to the approval of the Contract Administrator.

E35.5 Quality Control and Assurance

E35.5.1 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.

E35.5.2 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.

E35.6 Measurement and Payment

E35.6.1 The supply and installation of culverts will be measured and paid for in accordance with CW 3610.

E35.6.2 There shall be no measurement or payment for beveled ends. Beveled ends shall be included in the payment for the supply and installation of CSP culverts.

LANDSCAPING

E36. CLEARING AND GRUBBING

E36.1 Description

E36.1.1 This Specification shall cover the removal from the site of trees, stumps, roots, logs, brush, rubbish and all other surface litter within the full limits of the works, and the disposal of same in a manner hereinafter specified.

E36.1.2 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 performance and completion of all work as hereinafter specified.

E36.2 Materials

E36.2.1 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.

E36.3 Equipment

E36.3.1 General

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

E36.4 Construction Methods

E36.4.1 Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which trees and/or shrubs shall remain on site and be protected, if any. Those so designated shall be protected against damage from all construction activity.

E36.4.2 The Contractor shall restrict his activities strictly to within the limits of the works, unless receiving prior written approval from the Contract Administrator. Trees are to be felled so as to land within the limits of the works. The Contractor shall take all precautions to prevent damage to traffic, structures, pole lines, adjacent property and to trees and shrubs designated to be saved, and he shall be liable for any damages occurring in the performance of this work.

E36.4.3 The Contractor shall cut down all trees and shrubs, except those designated by the Contract Administrator to be saved, and grub out all stumps and roots. The Contractor shall load and haul all trees, stumps, roots, logs, brush, rubbish and all other surface litter

from the site and dispose of these materials at dumps located by the Contractor and approved by the Contract Administrator. Any materials dropped or spilled on any streets during the hauling operations shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

E36.4.4 The Contractor shall ensure that upon completion of the clearing and grubbing operations the site shall be left free of any hazardous depressions and in a neat condition.

E36.5 Quality Control and Assurance

E36.5.1 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.

E36.5.2 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.

E36.6 Measurement and Payment

E36.6.1 Clearing and grubbing will be measured on a area basis and paid for at the Contract Unit price per square metre for "Clearing and Grubbing", 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.

E37. GRAVEL SURFACING

E37.1 Description

E37.1.1 This specification covers the preparation of the granular seating node.

E37.2 References

E37.2.1 CW 3110 – Sub-grade, Sub-base and Base Course Construction.

E37.2.2 Refer to SCD-646 for details.

E37.3 Materials

E37.3.1 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.

E37.3.2 Granular Surfacing Material

(a) Supply surfacing material in accordance with Section 2.2 of CW 3110.

E37.4 Equipment

E37.4.1 General

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

E37.5 Construction Methods

E37.5.1 Placement of New Surfacing Material

(a) Place new surfacing material and compact to a minimum of 100% Standard Proctor Density in accordance with Section 3.4 of CW 3110.

(b) Level surfacing material to finished elevation.

(c) Stockpiling of unspread or surplus material on the existing pathway will not be permitted.

E37.5.2 Quality of Materials

(a) Determine the Standard Proctor Density of existing and new surfacing materials at the optimum moisture content in accordance with ASTM Standard D698. The filed density of each layer will be a percentage of the applicable Standard Proctor Density, in accordance with Section E37.5.1 of this specification.

(b) Utilize quality control tests to determine the acceptability of the layers, as placed and compacted before the succeeding layer may be applied.

(c) Verify the field density of the compacted layers by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

(d) The frequency and number of tests will be as directed by the Contract Administrator.

(e) Fill promptly, holes promptly made by the removal of samples from the layers with appropriate material and thoroughly compact so as to conform in every way with the adjoining material.

E37.6 Quality Control and Assurance

E37.6.1 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.

E37.6.2 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.

E37.7 Measurement and Payment

E37.7.1 Surfacing Material

(a) Surfacing material will be measured on a area basis and paid for at the Contract Unit price per square metre for "Supply and Install Granular Surfacing Material", 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.

(b) Only material placed within the limits of the resurfacing will be included in the payment for this Specification.

E38. EARTHWORK AND GRADING

E38.1 Description

E38.1.1 This Specification shall cover all phases of removal and/or placement of all materials necessary for the construction and preparation of embankments, slopes, drainage works, and approaches.

E38.1.2 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 performance and completion of all work as hereinafter specified.

E38.2 Materials

E38.2.1 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.

E38.2.2 Handling and Storage of Materials

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

E38.2.3 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) The Contract Administrator shall approve all materials at least ten (10) 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 Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E38.2.4 Fill Material

(a) Fill material for embankment construction shall be obtained from site excavation, from borrow sites as specified in the Specifications for the Work or shall be imported material, of a type approved by the Contract Administrator.

(b) Approved clay fill material shall consist of low to medium plastic clays or of mixtures of sand and clay, uniform in texture and suitable for compaction.

E38.2.5 Sub-base Material

(a) Sub-base material shall conform to Section 5.4 of Specification CW 3110.

E38.3 Equipment

E38.3.1 All equipment shall be of a size and type as required to complete the work in reasonable time as approved by the Contract Administrator, and shall be kept in good working order.

E38.4 Construction Methods

E38.4.1 Clearing and Grubbing

(a) No earthwork and grading shall commence until clearing and grubbing operations have been completed in accordance with Specification CW 3010 and the Drawings, and have been approved by the Contract Administrator. Refer to E36 for clearing and grubbing.

E38.4.2 Excavation

(a) Excavation shall consist of topsoil excavation, common excavation and borrow excavation, which shall be understood to mean the following:

(i) Common Excavation

I. The excavation of all material encountered within the limits of grading following topsoil excavation, the on-site placement or the stockpiling of suitable site material, and the satisfactory disposal of unsuitable site material such as frost heaving clays, silts, rock, rubble, rubbish and any surplus suitable site material, unless otherwise specified herein or in the Specifications for the Work.

E38.4.3 Preparation of Existing Ground Surface

(a) Before any embankment is placed on original ground having a smooth firm surface, the existing ground shall be scarified or ploughed so as to permit bonding with the new material.

(b) Where the existing ground surface is sloped sufficiently to affect the bond between the old and new materials the original ground on which the embankment is to be placed shall be ploughed deeply or stepped before embankment construction is commenced, as directed by the Contract Administrator.

(c) When embankment is being placed on an existing roadbed, the side slopes of the existing roadbed shall have vegetation removed and then be scarified or ploughed, as directed by the Contract Administrator, to ensure adequate bonding between the new embankment and the existing material.

(d) Following the excavation and disposal of unsuitable material and the preparation of the side slopes, as described above, the surface of the existing roadbed shall be

scarified to a depth of 150 mm, and compacted to the proper density, at the optimum moisture content.

(e) Where existing roadbeds are being widened and existing embankments extended, the existing slopes shall be denuded of all vegetation and either stepped or ploughed so as to form a medium of contact with the new embankment. Vertical cuts for the full depths of embankment shall not be permitted.

E38.4.4 Embankment

(a) Embankment construction shall be understood to mean the placing of suitable earth fill to obtain the required lines, grades and cross-sections shown on the drawings.

(b) Materials shall be deposited and spread in uniform layers of specified thickness, for the full width of the embankment. Each layer shall be shaped to line and cross-section and thoroughly compacted before the succeeding layer is placed.

(c) Where embankment is being placed on side fill or sloping sections, the lower portion shall be constructed as above, until a full width surface of the specified cross-section is obtained. The embankment shall be completed thereafter with full width layers.

(d) Flood protection embankment fill materials shall be clay fill material as specified in Clause 5.4.

E38.4.5 Compaction

(a) All material placed in embankments shall be spread and bladed smooth in successive layers not exceeding 150 mm in compacted thickness to the full width of the cross-section, unless otherwise directed by the Contract Administrator.

(b) Each layer, including the existing sub-grade, shall be compacted to a minimum of ninety-five (95%) percent of Standard Proctor Density. The material shall be compacted at the optimum moisture content, or up to two (2%) percent higher than optimum, as directed by the Contract Administrator.

(c) Where the grade line is in cut, the sub-grade shall be excavated to a minimum depth of 500 mm below the sub-grade line, or as directed by the Contract Administrator. The sub-grade shall then be reconstructed in layers as specified and compacted to ninety-five (95%) percent of Standard Proctor Density.

(d) Where the moisture content of the embankment material is too high, the material shall be thoroughly worked until the optimum moisture content is achieved.

(e) Where the moisture content of the embankment material is too low, the material shall be thoroughly disced and broken down, water added as required and the material thoroughly worked to mix the water throughout the material, prior to commencing compaction operations.

E38.4.6 Finishing and Maintaining

(a) The Contractor shall, as soon as practicable, bring the excavations and embankments to the correct widths, lines and grades as shown on the Drawings.

(b) All surfaces shall be maintained to the specified grade and cross-section and to the specified density until the project or that portion of the project is accepted.

E38.4.7 Boulevard Grading

(a) Boulevard grading shall be done and paid for in accordance with Specification CW 3110.

E38.5 Quality Control and Assurance

E38.5.1 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.

E38.5.2 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 Contract Administrator shall be afforded full access for the inspection and control testing of materials, both at the site of work and at any plant or borrow pit used for the supply of the materials, to determine whether the material is being supplied in accordance with this Specification. There will be no charge to the City for samples taken.

E38.5.3 Materials

(a) All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator in accordance with E38.2.3.

E38.5.4 Quality of Sub-grade and Embankment Materials

(a) The Standard Proctor Density for the sub-grade and embankment materials shall be determined at the optimum moisture content in accordance with ASTM Standard D698. The field density of each layer shall be a percentage of the Standard Proctor Density, as specified in E38.4.5.

(b) Quality control tests will be used to determine the acceptability of each layer, as placed and compacted by the Contractor, before the succeeding layer may be applied.

(c) The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

(d) The frequency and number of tests to be made shall be as determined by the Contract Administrator.

(e) Holes made by the removal of samples from the layers shall be promptly filled by the Contractor with appropriate material and thoroughly compacted so as to conform in every way with the adjoining compacted material.

E38.5.5 Corrective Action

(a) The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

E38.6 Measurement and Payment

E38.6.1 Common Excavation

(a) Common excavation will be measured on a area basis and paid for at the Contract Unit Price per square metre for “Common Excavation”, 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. No payment will be made for material removed outside of the limits of excavation.

(b) The area of common excavation shall be as measured in its original position, as computed from measurements made by the Contract Administrator.

E38.6.2 Fill Material

(a) The supply, loading, hauling, placing, and compaction of suitable site sub-base material will be measured on a area basis and paid for at the Contract Unit Price per square metre for “Placing Suitable Site Material”, 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. No payment will be made for material placed outside of the limits of placement as directed by the contract administrator.

E38.6.3 Preparation of Existing Ground Surface

(a) Preparation of existing ground surface will be measured on a area basis and paid for at the Contract Unit Price per square metre for “Preparation of Existing Ground Surface”, 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.

E39. TOPSOIL AND FINISH GRADING FOR ESTABLISHMENT OF TURF AREAS

E39.1 Description

E39.1.1 This Specification shall cover the supply and placing of topsoil for areas to be sodded or seeded.

E39.1.2 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 an incidental to the satisfactory performance and completion of all work as shown on the Drawings and hereinafter specified.

E39.2 Materials

E39.2.1 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 and/or the City’s designated turf inspector. There shall be no charge to the City for any materials taken by the Contract Administrator or the City’s designated turf inspector for inspection and testing purposes.

(c) Topsoil will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity) and volume of organic matter by a testing laboratory designated by the Contract Administrator.

(d) The Contract Administrator and/or the City’s designated turf inspector will collect as many samples as are deemed necessary to ensure that a good representation of the entire topsoil shipment is provided for the soil analysis report.

E39.2.2 Topsoil

(a) All topsoil required shall consist of a screened clay-textured or loam-textured dark topsoil, a fertile, friable material neither of heavy clay nor of very light sandy nature

containing by volume, a minimum of four (4%) percent for clay loams and two (2%) percent for sandy loams to a maximum twenty-five (25%) percent organic matter (peat, rotted manure or composted material) and capable of sustaining vigorous plant growth. Topsoil shall be free of subsoil contamination, roots, stones over 25mm in diameter, baler twine or subsoil clay lumps over 25mm in diameter and other extraneous matter.

(b) Topsoil shall not contain quackgrass rhizomes, Canada thistle roots or other noxious weeds. Upon delivery or thirty (30) days following delivery, salinity rating shall be less than 4.0mm hos/cm on a saturated paste basis. The pH range shall be between 6.0 - 8.0. Topsoil may be either on-site topsoil or imported topsoil.

(c) On-site topsoil which has been stockpiled, can be reused providing that it is shredded or screened prior to being re-spread and that it meets the requirements specified above for topsoil.

(d) Topsoil shall not be blow-in dirt taken from wind erosion sites and topsoil shall not be taken from fields abandoned to corn production where such soil may contain soil incorporated herbicides, such as eradicane and atrazine with lasting residual effects.

(e) The Contractor shall inform the Contract Administrator of proposed source of topsoil to be supplied. The Contract Administrator reserves the right to reject topsoil not conforming to the requirements of this Specification.

E39.2.3 Fertilizer

(a) Chemical fertilizer with an N-P-K analysis of 1-2-1 ratio at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

(b) Fertilizer shall be standard commercial brands meeting the requirements of the Canada Fertilizer Act and the Canadian Fertilizer Quality Assurance Program.

(c) All fertilizers shall be granular, pelletized or pill form, and shall be dry and free flowing.

E39.3 Equipment

E39.3.1 General

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

E39.1 Construction methods

E39.1.1 Site Safety and Traffic Control

(a) Where work is to be done in boulevard and median areas adjacent to roadways, the Contractor shall maintain traffic and ensure that protection is afforded to the road user and that the Contractor's operations in no way interfere with the safe operation of traffic.

(b) The Contractor shall supply, erect and maintain all applicable traffic control devices in accordance with the provisions of the latest edition of the Manual of Temporary Traffic Control in Work Areas on City Streets issued by the Public Works Department of the City of Winnipeg.

E39.1.2 Preparation of Existing Grade

(a) Subsoil shall be graded in accordance with Specification CW 3110 to eliminate uneven areas and low spots, ensuring positive drainage. Any soil contaminated by toxic materials shall be removed and disposed off site.

(b) All surface debris, roots, vegetation, branches and stones in excess of 25mm shall be removed.

(c) Grades on the area to receive topsoil that have been previously established in conformance with the Construction Drawings and/or other applicable specifications shall be maintained in a true and even grade.

(d) Prior to placing topsoil, all sub-grade areas within athletic fields and all athletic field "run out" areas as Identified on the construction drawings shall be scarified to a minimum depth of 75mm.

E39.1.3 Placing of Topsoil

(a) The Contractor shall not commence placement of topsoil until the sub-grade has been inspected and approved by the Contract Administrator.

(b) The Contractor shall provide the Contract Administrator with a minimum of two working days notice for inspection of required grading.

(c) The topsoil mix shall be applied to a minimum of 75 mm compacted depth for areas requiring sod and a 100 mm compacted depth for seeding areas. All areas shall be rolled with a mechanical roller of a minimum weight of 220kg and minimum width of 760mm.

(d) Topsoil shall be manually spread around trees, shrubs and other obstacles.

(e) The Contractor shall ensure that topsoil does not come in contact with new asphaltic concrete pavement that is less than 2 weeks old.

E39.1.4 Application of Fertilizer

(a) The Contractor shall provide the Contract Administrator with a report for each work site indicating the fertilizer formulation used, the rate of application and the date of application.

(b) Fertilizer shall be spread uniformly over the entire area of topsoil at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

E39.1.5 Finish Grading and Rolling

(a) The area shall be fine graded and the topsoil loosened. Eliminate rough spots and low areas to ensure positive drainage. Prepare a loose friable bed by means of cultivation and subsequent raking.

(b) Topsoil shall be rolled with a mechanical roller of a minimum weight of 220kg, minimum width of 760mm roller, to consolidate it in areas to be seeded or sodded, leaving the surface smooth, uniform, firm against deep foot printing and to the satisfaction of the Contract Administrator.

E39.1.6 Site Clean-Up

(a) All sidewalks, streets, approaches, driveways and properties near the Work Site shall be kept clean at all times by the Contractor.

(b) Upon completion of the project, the Contractor shall immediately remove all excess material and debris from the Work Site.

E39.2 Quality Control and Assurance

E39.2.1 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.

E39.2.2 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.

E39.1 Measurement and Payment

E39.1.1 Topsoil and finish grading will be measured on a area basis and paid for at the Contract Unit Price per square metre for “Topsoil and Finish Grading”, 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.

E39.1.2 No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

E40. TREE AND SHRUB PRESERVATION AND PROTECTION DURING CONSTRUCTION

E40.1 Description

E40.1.1 This specification shall cover tree and shrub preservation and protection during construction.

E40.1.2 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.

E40.2 References

E40.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Refer to related specifications CW-3170 and CW-3540

E40.2.2 Definitions

(a) Access Routes: A route that is required for access to the construction site or is otherwise required for work to commence.

(b) CA: Contract Administrator

(c) City Forester or Designate: As represented by a person employed by the City of Winnipeg as an Urban Forester, Supervisor of Urban Forestry Technical Services, or Forestry Technician authorized to provide Consulting Services.

(d) Construction Area: The entire area of site disturbance, including excavation, construction traffic, equipment, and materials storage, staging and parking areas, and access points.

(e) DBH: Diameter at Breast Height – a measurement of the tree trunk, in centimeters, taken at 1.4m above grade.

(f) Impervious Surface: An area with an existing paved surface such as concrete, asphalt surface, brick, or compacted granular.

(g) Qualified Arborist: An arborist that holds a valid arborist certification with a certification number with the International Society of Arboriculture (ISA) and meets the general Contractor requirements for the City of Winnipeg.

(h) TPZ: Tree protection zone. This includes the soil inside the TPZ and the entire tree including roots. Any area outside of the Extent of Vegetation Repair areas as noted on the Landscape Planting Plan will be considered a tree and shrub protection zone in addition to the TPZ setbacks as calculated in Section 41.7.3.

(i) TPZ Barrier: A physical barrier at the edge of the TPZ to ensure protection of the TPZ.

(j) Tree and Shrub Protection Plan: Is a report that outlines how construction work is to be done and the steps to be taken to protect trees and shrubs within and adjacent to the construction site.

E40.3 Scope of Work

E40.3.1 This Specification shall cover the protection of all existing trees and shrubs within the limits of the site. 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 performance and completion of all Work hereinafter specified.

E40.4 Submittals

E40.4.1 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 tree and shrub preservation and protection schedule, including methods and sequence of operations.

E40.4.2 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.

E40.4.3 The Contract Administrator is to be notified 3 business days in advance of any large equipment to be working in the vicinity of existing trees and shrubs. The Contractor shall provide adequate personnel on foot to supervise equipment operators in the vicinity of the trees and shrubs to ensure that no damage occurs.

E40.4.4 Special care is required during excavation to ensure existing tree and shrub root structure is not damaged. Should root pruning be required, the Contractor must inform the Contract Administrator, and must ensure proper root pruning techniques are employed by an Arborist.

E40.5 Materials

E40.5.1 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.

E40.5.2 Protection Barrier Fence

(a) Moulded Mesh Vinyl Construction Fence, Snow Fence or other similar product - Rolled; 1.2m high; Commercial Grade; Colour: Orange

(b) Steel T-Bar Stakes; 1.8m high; c/w tie holes; Galvanized, Painted or Powder Coated. In sufficient quantity to hold the fence taught and erect without slumping. All steel t-bar stakes to be spray painted bright yellow, red or orange or flagged with flagging tape.

(c) Steel Tie Wire; heavy gauge

E40.6 Equipment

E40.6.1 General

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

E40.7 Construction Methods

E40.7.1 Tree and Shrub Protection

(a) No public tree may be pruned, damaged, or removed, without the written consent from the City Forester or Designate. No public shrub may be pruned, damaged, or removed, without the written consent from the Contract Administrator.

(b) Where trees and shrubs are to be preserved, a Tree and Shrub Protection Plan is required to be submitted to the CA before any construction begins.

(c) Specification for Tree and Shrub Protection Zone applies to all public trees and shrubs where the TPZ intersects with the Construction Area.

E40.7.2 Tree and Shrub Protection Zone (TPZ)

(a) A TPZ shall be established by surrounding all Tree, Shrub and Root Zones that are to be protected.

(i) No activity is permitted inside the TPZ, including any traffic, construction excavation, change of grade, or disposal/storage of materials, chemicals.

(ii) No accumulation of water or other substances as a result of activities associated with construction is permitted within the TPZ.

(iii) No parking of vehicles or equipment.

(iv) The outside of the boundary of the TPZ shall be delineated by a physical barrier as specified in E40.5.2.

E40.7.3 TPZ Setback Distance

(a) Any area outside of the Extent of Vegetation Repair areas as noted on the Landscape Planting Plan will be considered a tree and shrub protection zone in addition to the TPZ setbacks as calculated below.

(b) The following chart identifies the required distance for a TPZ. Distance is to be measured from the outside edge of the tree trunk, 30 cm above grade.

Trunk Diameter (DBH)	Minimum Protection Distance Required
< 10.1 cm	2.0 m
10.1 - 40.0 cm	2.4 m
40.1 - 50.0 cm	3.0 m
50.1 - 60.0 cm	3.6 m
60.1 - 70.0 cm	4.2 m
70.1 - 80.0 cm	4.8 m
80.1 - 90.0 cm	5.4 m
90.1 – 100.0 cm	6.0 m
> 100.0 cm	6.0 cm for each 1.0 cm of trunk diameter

(c) A physical TPZ barrier shall be constructed prior to the commencement of any disturbance on the Site by erecting a barrier as described in E40.5.2.

(i) The Contractor shall obtain approval from the CA for placement and installation of barriers prior to commencing any construction activities.

(ii) Barriers are to remain in place and be fully functional throughout the duration of the project until all work is completed to the satisfaction of the CA.

(iii) Where the TPZ is interrupted by an impervious surface, the TPZ barrier will be installed at the edge of the hard surface area.

E40.7.4 Materials for the TPZ Barrier shall meet the following specifications:

(a) Fence to consist of chain link construction fencing anchored or held in place to the satisfaction of the CA.

(b) Where fill or excavation material must be stored within 1m of the outside of the TPZ, a barrier of ¾" thick plywood must be securely installed along the outside of the fencing and must be long enough to accommodate the full extent or fill or excavated material to ensure that no material enters the TPZ.

(c) The fence must be minimum 1.2 m in height to a maximum 2 m in height. Adjustments may be made where height interferes with the normal branching habit of the tree or shrub and as accepted by the CA.

(d) A "Tree and Shrub Protection Zone" sign must be mounted on any side facing foot and vehicular traffic, including construction traffic. The sign shall be produced in colour and be 45X60cm in size and made of white coroplast. A template for the sign will be provided by the CA. Only the provided design shall be used.

E40.7.5 Pruning of Tree and Shrub Branches

(a) Branch pruning shall be performed prior to the start of the work to avoid anticipated conflicts between tree and shrub branches with construction activities or structures and are only to be performed with the written consent of the CA. All tree pruning is only to be performed by a Qualified Arborist.

(b) Branch pruning shall be in accordance with practices found in the latest edition of the American National Standards Institute (ANSI) A300 and the latest edition of the companion publication "Best Management Practices – Tree Pruning".

(c) No above-ground pruning work shall be permitted on elm trees for the period April 1st to July 31st in accordance with the Manitoba Forest Health Protection Act and Regulations unless deemed a safety hazard by the CA.

(d) Wood handling, transport, and disposal shall be in accordance with Provincial and Federal legislation.

E40.7.6 Pruning of Tree and Shrub Roots

(a) Root pruning shall be performed prior to start of the work to avoid anticipated conflicts between tree and shrub roots and construction activities or structures and are only to be performed with the written consent of the CA.

(b) Root pruning shall be done in accordance with practices found in the latest edition of the American National Standards Institute (ANSI) A300 and the latest edition of the companion publication "Best Management Practices – Root Pruning".

(c) All exposed or surface roots greater than 40mm diameter damaged at the edge of the TPZ shall be cut cleanly by sawing. Severing or crushing roots by excavator or other mechanical device is not acceptable.

(d) Wood handling, transport, and disposal, shall be in accordance with Provincial and Federal legislation.

E40.7.7 Activities within the TPZ Subject to Approval

(a) Specific activities that must occur within the TPZ are subject to approval by the CA and may be permitted under the following conditions.

(b) When access to the site must transect the TPZ because no alternative access routes are available, the access route shall be constructed using either:

(i) A layer of wood chips 100 mm (4 inches) high covered with 50mm (2 inch) thick plywood, at minimum.

(ii) Compaction mats of sufficient size and weight-bearing capacity for the planned work.

(c) Where work must be performed within the TPZ Barrier to install or repair underground utilities, tunneling or directional boring is preferred to open trenching across the roots as defined in CW2110 and CW 2130. All work must be in accordance with the latest edition of the American National Standards Institute (ANSI) A300 and the latest edition of the companion publication “Best Management Practices – Managing Trees During Construction”.

(d) If excavation is the only acceptable means of access to utilities, then the Contractor must arrange for Qualified Arborist to be on site to minimize risk to the public, workers, and tree(s).

E40.7.8 Removal of Specified Existing Trees

(a) Only trees indicated on the drawings are to be removed. The Contractor is to flag all trees to be removed for review by the CA.

(b) All trees to be removed are to be inspected and appraised by Urban Forestry prior to removal.

E40.7.9 Tree Protection Plan Violations, Tree Damage, and Compensation

(a) Any damage that occurs to the above-ground parts of the tree, the roots, or soil within the TPZ is subject to assessment by the City Forester or Designate.

(b) Damaged branches, roots, or any part of the tree that may pose a safety risk is to be reported immediately to the CA.

(c) Where damage is deemed to be reparable, all remedial pruning or soil amendment activities must be performed by a Qualified Arborist.

(d) The Contractor shall be responsible for the cost of any work required to repair damages to the tree or soil found within the TPZ.

(e) In cases where the City Forester or Designate determines that damage to:

(i) any public tree(s) not authorized for pruning or removal as part of the Work; or

(ii) any tree identified for preservation within the Construction Area and included on the Tree and Shrub Protection Plan results in an irreparable risk to public safety, affected trees shall be removed by a Qualified Arborist, and the expense of the Contractor.

(f) Damage to any public tree(s) not authorized for pruning or removal as part of the Work, or failure to adhere to the approved Tree and Shrub Protection Plan shall result in compensation requirements for the appraised value for damage to any part or whole tree(s); as determined by the City Forester or Designate.

(g) Financial compensation shall be paid to the City of Winnipeg Urban Forestry Branch and submitted to 1539 Waverley Street, R3T 4V7.

(h) Compensation will be calculated as follows:

(i) For trees 10cm DBH and less, compensation values will be determined by the Urban Forestry’s Branch current cost of replacement (for the same or similar tree species).

(ii) For trees greater than 10cm DBH, compensation values will be determined by using the method described in the latest edition of “The Guide for Plant Appraisals” by the Council of Tree and Landscape Appraisers.

E40.7.10 Shrub Protection Plan Violations, Shrub Damage, and Compensation

(a) Any damage that occurs to the above-ground parts of the shrub, the roots, or soil within the TPZ is subject to assessment by the CA.

(b) Damaged branches, roots, or any part of the shrub that may pose a safety risk is to be reported immediately to the CA.

(c) Where damage is deemed to be reparable, remedial pruning or soil amendment activities are to be approved by the CA prior to work being performed.

(d) The Contractor shall be responsible for the cost of any work required to repair damages to the shrubs or soil found within the TPZ.

(e) In cases where the CA determines that damage to:

(i) any public shrub(s) not authorized for pruning or removal as part of the Work; or

(ii) any shrub identified for preservation within the Construction Area and included on the Tree and Shrub Protection Plan results in an irreparable risk to public safety, affected shrubs shall be removed at the expense of the Contractor.

(f) Damage to any public shrub(s) not authorized for pruning or removal as part of the Work, or failure to adhere to the approved Tree and Shrub Protection Plan shall result in compensation requirements for the appraised value for damage to any part or whole tree(s); as determined by the CA.

(g) Financial compensation shall be paid to the Owner.

(h) Compensation will be calculated at the current cost for replacement.

E40.8 Quality Control and Assurance

E40.8.1 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 Contractor must remove debris and leave work site clean, upon completion of Work

(e) The Contractor is to use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water when cleaning.

E40.8.2 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) All damage to existing trees and shrubs caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator at the cost of the Contractor. Damages to all trees must be repaired by a Qualified Arborist.

(e) Any trees deemed to have died or that are dying due to damage from carelessness during Construction will be assessed by an Arborist, and shrubs are to be assessed by the CA at the Contractor's cost, for removal and replacement under the contract. Costs will be determined by factors such as size, market price of the largest transplantable tree or shrub of same or different species and may include appraised value of existing tree(s) as determined by current International Society of Arboriculture evaluation procedures.

E40.9 Measurement and Payment

E40.9.1 Protection of trees, shrubs and natural areas will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E41. TREE, SHRUB, AND PERRENIAL PLANTING

E41.1 Description

E41.1.1 This specification shall cover the supply and installation of nursery grown plant material, mulch, planting and maintenance within the limits of the site.

E41.1.2 Furnishing all labour, materials, equipment, supervision, incidentals and all other miscellaneous works required to complete the work as shown and detailed on the drawings and/or as specified herein.

E41.2 References

E41.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) The specification shall supplement the most up to date version of City of Winnipeg Tree Planting and Maintenance Specification.

(b) Agriculture and Agri-Food Canada (AAFC). .1 Plant Hardiness Zones in Canada-2000.

(c) Canadian Nursery Landscape Association (CNLA). .1 Canadian Standards for Nursery Stock-2006, 8th Edition

(d) Refer to SCD-517 for details.

E41.3 Scope of Work

E41.3.1 The Work under this Specification shall include the supply and installation of nursery grown plant material, mulch, planting and maintenance.

E41.4 Submittals

E41.4.1 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.

E41.4.2 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.

E41.4.3 Submit product sample to Contract Administrator at least 14 days prior to installation for: Natural Mulch.

E41.5 Materials

E41.5.1 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.

E41.5.2 The Contractor shall be responsible for the supply of:

(a) Trees:

(i) Type of root preparation, sizing, grading and quality: comply with Canadian Standards for Nursery Stock

(ii) Source of plant material: grown in local climate or project site. Free of disease, insects, defects or injuries and structurally sound with strong fibrous root system

(iii) The Contract Administrator may reject any material(s) that do not comply with this specification at no additional charge to the Owner.

(b) Plant Material:

(i) Plant material shall be of the species and sizes noted on drawings. Plant material which does not meet requirements specified will be rejected.

(ii) All nursery stock supplied shall be from a Canadian prairie nursery grown root or seed stock.

(iii) Any nursery stock dug from native stands, wood lots, orchards or neglected nurseries and which have not received proper cultural maintenance as advocated by the CNLA Canadian Standards for Nursery Stock shall be designated as “collected plants”. The use of “collected plants” will not be permitted unless approved by the Contract Administrator.

(iv) All shrubs and perennials shall be specimen container grown with vigorous roots, free of disease and insects.

(v) The Contract Administrator reserves the right to inspect the plant material at their original source, and to instruct the supplier on root and branch pruning requirements.

(vi) Nomenclature of specified nursery stock shall conform to the ISHS International Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Hortus Third. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trades.

(vii) Plants larger than specified may be used if approved by the Contract Administrator. The use of such plants shall not increase the Contract price.

(viii) All nursery stock shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip.

(ix) Where trees are measured by caliper (cal.), reference is made to the diameter of the trunk measured 150 mm above ground as the tree stands in the nursery.

(x) All nursery stock shall be well branched, true to type, structurally sound, possess a well-developed, undamaged root system and shall be free of disease, insect infestations, rodent damage, sunscald, frost cracks and other abrasion or scar to the bark. All parts of the nursery stock shall be moist and show live, green cambium when cut.

(xi) All trees shall have one only, sturdy, reasonably straight and vertical trunk and a well-balanced crown with fully developed leader. All evergreens shall be symmetrically grown and branched from ground level up, and must be balled and burlapped unless noted otherwise on the plant list.

(xii) At least one plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant and shall remain on the plant material through to final inspection.

(c) Planting Soil:

(i) The planting soil shall be topsoil that complies with E39.

(ii) Planting soil shall contain maximum ten percent (10%) organic matter (peat, rotted manure or composted material).

(iii) At the discretion of the Contract Administrator, planting soil may be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity), and volume of organic matter, by a testing laboratory designated by the Consultant.

(iv) The Contract Administrator reserves the right to reject planting soil not conforming to the requirements of these Specifications.

E41.5.3 Water:

(a) The Contractor shall provide water, so that:

(i) All costs to provide water for the watering operation and all associated costs shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees as applicable.

(ii) The Contractor shall pay for all costs associated with obtaining water. Sewer charges will not be assessed for water obtained from a hydrant

(iii) Water shall be free of oils, acids, alkalis, salts and other substances that may be detrimental to plant growth. Water suitable for human consumption shall be acceptable without testing.

(iv) Water from rivers and streams shall not be used without prior approval of the Contract Administrator.

(v) Should the Contract Administrator determine that water quality testing is necessary, an approved testing laboratory shall perform the test at the sole expense of the Contractor.

E41.5.4 Trunk Protection and Tree Support:

(a) Upon completion of the planting operation, the Contractor shall install trunk protection around tree trunks by slicing open a 100 mm diameter x 600 mm long section of plastic weeping tile material and placing it around the base of each tree trunk.

(b) Tree support stakes shall be round hardwood stakes 40 mm diameter x 1540 mm long. Stakes shall be uniform in style and colour.

(c) Shrubs and perennials shall be surrounded with wire mesh protective fencing. 10 gauge 50mm x 50mm galvanized welded wire mesh. Fastened to wood stakes and extending 50mm higher than the stakes to form fencing around shrubs, perennials and mass planting areas.

(d) Other products may be used with prior permission in writing from the Contract Administrator.

E41.5.5 Natural Mulch:

(a) Contractor to supply mulch. Mulch shall:

(i) Be free of organic and inorganic debris and material.

(ii) Not contain adhesives, wood preservatives or any other chemical contaminants.

(iii) Consist of chips not less than 15 mm nor larger than 75 mm in size and not more than 20 mm thick.

(iv) Contractor shall supply a sample of natural mulch for approval to the Contract Administrator prior to construction.

E41.6 Equipment

E41.6.1 General

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

E41.7 Construction Methods

E41.7.1 Supply and Re-planting Care of Trees, shrubs, and Perennials

(a) The Contractor shall be responsible for supplying and transporting plant material to the designated placement locations.

(b) The Contractor shall coordinate the shipping of trees, shrubs, and perennials to ensure no more than a maximum 24 hour time lapse has occurred between the plant material arriving on Site and the installation of that plant material.

(c) Plant material shall be transported with care taken to prevent damage:

(i) Protect plant material against abrasion, exposure and extreme temperature change during transit.

(ii) Avoid binding of plant material with rope or wire that would damage bark, break branches or destroy natural shape of tree, shrub, or perennial.

(iii) Give full support to root ball of plant material during lifting:

I. Each balled specimen shall be handled with sufficient care, so that the root balls shall not be broken;

II. Broken root balls or root ball consisting of loose soil will not be accepted and shall be replaced;

III. Broken roots of deciduous stock shall be pruned back prior to planting.

(iv) Point of contact with equipment shall be padded.

(d) Trees with broken or damaged branches/trunks are not acceptable, however caused, and can be rejected. Trampled, broken or damaged shrubs and perennials, however caused, are not acceptable and can also be rejected.

(e) Keep roots moist and protected from sun and wind:

(i) Plant material that cannot be planted immediately shall be well protected against damage and drying out.

E41.7.2 Plant Placement and Layout

(a) The Contractor shall obtain all necessary utility clearances prior to the commencement of planting and in a timely manner so as not to jeopardize the schedule of the planting component of the project.

(b) The Contractor is to comply with the instructions on the utility clearance sheets.

E41.7.3 Location and Schedule of Work

(a) The Contractor's operations shall be limited to the minimum encroachment on private properties necessary for undertaking the Work.

(i) The Contractor shall be responsible for all damage resulting from Work on or over private property.

(b) The Contractor shall promptly report any delay or change that may affect an agreed commencement and/or completion date to the Contract Administrator.

(c) All plant locations shall be staked on site and approved by the Contract Administrator prior to planting.

E41.7.4 Pre-Planting Preparation

(a) Refer also to CW3540, Topsoil and Finish Grading.

(b) For individual tree pits:

(i) Stake out location and obtain approval from the Contract Administrator prior to excavating.

(ii) Excavate to depth and width as indicated.

(iii) The preferred method of excavation is by backhoe or hand shovel.

(iv) Remove subsoil, rocks, roots, debris, and toxic material from excavated material that will be used as planting soil for trees and perennials. Dispose of excess material.

(v) Pit depth shall be such that the top of the root ball is even with the final grade.

(vi) Scarify sides of planting hole.

(vii) Remove water which enters excavations prior to planting. Notify the Consultant if water source is ground water.

(viii) Tree pits shall be left open for a maximum of 24 hours.

(ix) Pits that are left open overnight must be covered with a sheet of plywood and be marked with a minimum of one (1) safety cone.

(x) Plywood shall be a minimum thickness of 15mm (5/8”).

E41.7.5 Planting Period

(a) The Contractor shall not plant vegetation during periods of extreme heat, at the discretion of the Contract Administrator.

E41.7.6 Planting

(a) The Contractor is expected to install plant material as follows:

(i) Trees, shrubs, and perennials shall be set plumb and in the centre of the planting pit.

(ii) Plant material shall be placed on undisturbed soil and to a depth equal to that at which they were originally growing at the nursery, such that the first order of roots are just below grade.

(iii) Once a tree, shrub, or perennial has been set in its final position, burlap on the root ball shall be cut from the top 1/3 of the root ball:

(iv) If a wire basket has been used, it shall be folded back or cut off from the top of the root ball.

(v) All twine shall be removed from the root ball.

(vi) After the root ball is prepared, fill tree pit with planting soil, in layers of 150 mm depth and compact the independent layers of soil by tamping.

(vii) Tamp soil around root system to eliminate air voids.

(viii) Grade the area around the plant material according to the drainage type. Form watering saucer as indicated.

(ix) All planting areas shall be levelled, raked and edged to give a neat appearance.

(b) Upon completion of the planting operation, the Contractor shall:

(i) Install bark mulch or stone mulch.

I. Ensure soil settlement has been corrected prior to mulching.

II. Spread mulch as indicated.

(ii) Administer watering:

I. Watering must be done slowly to ensure that water does not run away from the root zone and so the top 300 mm of the soil around the root system of the plant material is well saturated.

II. Use a low-pressure open flow nozzle and hose.

III. The water stream must not gouge out a hole in the soil or mulch.

E41.7.7 Site Clean-up

(a) During the planting operations, all sidewalks, streets, approaches, driveways and properties near or about the planting operations, shall be kept clean at all times by the Contractor.

(b) Upon completion of the Work, the Contractor shall immediately remove all excess material and debris from the Work Site and shall leave the Site in a clean and orderly manner.

E41.8 Maintenance

E41.8.1 General

(a) The Contractor shall be responsible for the maintenance of all plant material during establishment period.

(b) The Contractor shall be responsible for the maintenance of all plant material for a period of 1 (one) year, from date of acceptance. Plant material shall be accepted to start warranty when installation in accordance with the Drawings and Specifications is complete and there is no sign of wilting, chlorosis, pest infestation, transplant shock or any conditions deleterious to longevity and appearance. Defective plants shall be replaced within thirty (30) days of notification by the Contract Administrator and shall be further maintained for the established maintenance period of 1 (one) year at no additional cost to the Owner.

(c) The Contractor shall submit a maintenance schedule to the Consultant prior to the commencement of the 1 (one) year maintenance period. The Contractor shall notify the Consultant of any change to the submitted maintenance schedule with minimum two (2) days advance notice.

(d) The Contractor shall furnish all labour, materials, equipment and services necessary to perform ongoing care of the plant material, which shall include but not be limited to:

(i) Mulching, in accordance with E41.5.5.

(ii) Watering, in accordance with E41.5.3.

(iii) Weed Control, in accordance with E41.8.2(a).

E41.8.2 Methods

(a) The Contractor shall:

(i) Program the timing of operations to plant growth, weather conditions and use of the Site.

(ii) Do each operation continuously and complete within a reasonable time period.

(iii) Store equipment and materials off-site.

(iv) Add additional mulch as required to maintain minimum constant depth of mulch.

I. Clean up edges and contain mulch within the designated area.

(v) Water plant material as follows:

I. Immediately upon being planted and 3 (three) times a week for the first three (3) weeks after planting.

II. Thereafter, watering shall be done every 7 – 14 days between May and October or as frequently as necessary (compensating appropriately for weather) to sustain vigorous plant growth.

III. By watering slowly to ensure that water does not run away from the root zone and so the top 300 mm of soil around the root system of the plant material is well saturated.

IV. By using a low pressure open flow nozzle and hose. The water stream must not gouge out a hole in the soil or mulch.

V. By using the recognized standard for tree watering as approximately 8-10 times during the growing season with the following amounts of water depending on the caliper of the tree – the rule of thumb is 40 litres of water per 25 mm caliper.

VI. By recognizing watering requirements of plant material are dependent upon a number of variables such as species, soil type, when planted, and weather including precipitation. These watering requirements are a minimum standard and shall be followed unless otherwise directed by the Contract Administrator.

VII. By applying a final watering for all plant material, regardless of when planted, that shall be completed after temperatures fall below freezing to ensure adequate moisture in root zone at freeze-up.

(vi) Maintain surface of planting bed by hand weeding during the watering process as follows:

I. Do not allow weeds to establish for a period longer than 2 (two) weeks.

II. Do not use any herbicides for weed control near trees unless authorized by the Contract Administrator.

(b) The Contractor must inform the Contract Administrator of watering progress and schedule by 9:00 AM each day of watering.

(c) The Contractor must inform the Contract Administrator immediately of any equipment breakdown or delay in watering and maintenance. Once a watering cycle is completed, submit a log-sheet to the Contract Administrator identifying the following:

(i) The location where maintenance Work is carried out.

(ii) Preventive or corrective measures required which are outside Contractors' responsibility.

E41.8.3 Tree Protection / Supports

(a) Ensure trunk protection collars (weeping tile) and tree supports (staking, cages) are maintained in good condition, serving their intended function and posing no threat to public safety.

(b) The tree protection collars (weeping tile) shall be left on trees after the maintenance period is completed.

(i) The Owner shall assume responsibility for collar removal.

(c) Tree supports and cages shall be removed or left in place at the end of the warranty period as directed by the Contract Administrator.

E41.9 Quality Control and Assurance

E41.9.1 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.

E41.9.2 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.

E41.9.3 Damage to Property

(a) The Contractor shall take every precaution not to damage, injure or mark any existing structures or landscaping on the street allowance or adjacent properties.

(b) Should any damage be caused by the Contractor, their employees or equipment, It shall be restored or replaced at the Contractor's expense and to the satisfaction of the Contract Administrator. This applies even if damage results from work done in the process of correcting deficiencies.

E41.9.4 Plant Material Mortality

(a) Contractor Supplied Plant Material:

(i) If a Contractor-supplied plant material dies and the Contractor has not been submitting the regular maintenance records in accordance with these specifications, then the cost to supply, plant and maintain the plant material for the established maintenance period of 1 (one) year as originally indicated in the contract documents, shall be at the sole expense of the Contractor.

(ii) If a Contractor-supplied plant material dies and the Contractor has been submitting the regular maintenance records in accordance with these specifications, the Contractor shall supply and plant a replacement plant material at no additional cost to the Owner. The maintenance period will not be extended beyond 1 (year) from date of acceptance of original plant material.

(iii) Inspections of replacement plant material will be conducted by the Contract Administrator.

E41.10 Measurement and Payment

E41.10.1 Tree planting will be measured on a unit basis and paid for at the Contract Unit Price per tree for "Supply and Install Deciduous Shade Trees", 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.

E41.10.2 Shrub planting will be measured on a unit basis and paid for at the Contract Unit Price per tree for "Supply and Install Deciduous Shrubs Complete with Planting Bed and Plant Protection", 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.

E41.10.3 Perennial vine planting will be measured on a unit basis and paid for at the Contract Unit Price per tree for "Supply and Install Native Perennial Vines Complete with Planting Bed and Plant Protection", 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.

E41.10.4 The installation of all planting beds and tree, shrub, and perennial protection as well as the maintenance of all plant material will be considered incidental to the Work. No separate measurement or payment shall be made for this work.

E42. SITE FURNISHINGS

E42.1 Description

E42.1.1 This specification shall cover the supply and installation of new landscape furnishings.

E42.1.2 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.

E42.2 References

E42.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) All products shall be supplied as specified; alternative or equivalent products must be approved by the Contract Administrator.

(b) All items shall be installed in accordance with the manufacturer's recommendations or the construction drawings.

(c) All necessary steps shall be taken to ensure proper protection of the work and materials before, during and after installation. In addition, the installed work and materials of other trades shall be properly protected.

(d) All concrete bases for the site furnishings shall be installed in accordance with CW2160.

(e) Refer to SCD-119 and SCD-121A for details.

E42.3 Scope of work

E42.3.1 The Work under this Specification shall include supply and install of one (1) Tache Bench, one (1) Ornamental Flat Slat Galvanized Waste Receptacle, and one (1) Waste Receptacle Insert as shown in the drawing package including all required bases and hardware.

E42.4 Submittals

E42.4.1 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.

E42.4.2 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.

E42.4.3 The Contractor shall submit Product Data including a complete materials list under this portion of the work, giving the manufacturer's names, catalog number and catalog cut for each item.

E42.4.4 The Contractor shall submit the manufacturer's current recommended method of installation and attachment with the materials list.

E42.5 Materials

E42.5.1 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.

E42.5.2 Site Furniture

(a) The Contractor is responsible for the supply and install of the following items:

(i) Tache Bench (in-ground backed bench with arms)

I. Product: 52501085GLV
II. Finish: Galvanized metal and composite (cedar tone)
III. Quantity: 1
IV. Supplier: Centralized Park Services

(ii) Ornamental Flat Slat Galvanized Waste Receptacle
I. Product: 52501063GLV
II. Finish: Galvanized
III. Quantity: 1
IV. Supplier: Centralized Park Services

(iii) Waste Receptacle Insert
I. Product: 55501063GLVi
II. Finish: Galvanized
III. Quantity: 1
IV. Supplier: Centralized Park Services

E42.6 Equipment

E42.6.1 General

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

E42.7 Quality Control and Assurance

E42.7.1 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.

E42.7.2 Quality Assurance

(a) All materials will be subject to physical inspection by the Contract Administrator and will be subject to rejection during the course of the Work and for the length of time as specified in the General Conditions, 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.

E42.8 Measurement and Payment

E42.8.1 Supply and install Tache bench complete with concrete base will be not be measured. Supply and install Tache bench complete with concrete base will be paid for at the

Contract Lump Sum Price for “Supply and Install Tache Bench Complete with Concrete Base”, 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. Notwithstanding City of Winnipeg standard specification CW-2160, concrete for bench bases shall not be measured and will be considered incidental to the Work.

E42.8.2 Ornamental flat slat galvanized waste receptacle complete with insert and concrete base will be not be measured. Ornamental flat slat galvanized waste receptacle complete with insert and Concrete Base will be paid for at the Contract Lump Sum Price for “Ornamental Flat Slat Galvanized Waste Receptacle Complete with Insert and Concrete Base”, 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. Notwithstanding City of Winnipeg standard specification CW-2160, concrete for waste receptacle base shall not be measured and will be considered incidental to the Work.

E42.9 Warranty

E42.9.1 Site furnishings are to be guaranteed against defects in materials and workmanship for a period of 12 (twelve) months from the date of substantial completion.

E42.9.2 The Contractor is not responsible for acceptable wear through the usage or acts of vandalism.

MANITOBA HYDRO WORKS

E43. INSTALLATION OF STREET LIGHTING AND ASSOCIATED WORKS

E43.1 Definitions

E43.1.1 **“LIMITS OF APPROACH”** means the shortest distance that is permissible between live high voltage (>750 volts) conductors or apparatus and any part of a worker’s body, material or tools being handled, or equipment operated.

E43.1.2 **“MANITOBA HYDRO CENTRAL STORES”** means Manitoba Hydro's Waverley Service and Reclaim Centre - 1840 Chevrier Blvd - Winnipeg, Manitoba

E43.1.3 **“OVERHEAD FEED”** means an electrical supply via an overhead conductor connected between streetlight standards. Typically strung between standards on a temporary basis.

E43.1.4 **“OVERHEAD SOURCE”** means an electrical supply from Manitoba Hydro’s system. (Typically, an overhead conductor from a wooden distribution pole or a DIP/RISER located on a wooden distribution pole.)

E43.1.5 **“RECLAIM”** material means existing material that has been removed from Manitoba Hydro’s system and to be returned to Manitoba Hydro.

E43.1.6 **“SCRAP”** material means existing material that has been removed from Manitoba Hydro’s system and to be recycled/disposed of by the Contractor.

E43.1.7 **“SURPLUS”** material means new material that has been requisitioned by the Contractor and not incorporated into the work at the end of the Contract.

E43.1.8 **“WORK CLEARANCE”** means an ELECTRICAL AND/OR NATURAL GAS FACILITIES LOCATE form (see SAMPLE ONLY included as Appendix F) issued by each of Manitoba Hydro’s Customer Service Centre (CSC) affected to permit work to commence (Permit to work).

E43.2 Description

E43.2.1 The work shall consist of the supply of all supervision, labour, materials (except as indicated under MATERIAL SUPPLIED BY MANITOBA HYDRO below) insurance, tools, backfill and equipment (and their maintenance), transportation, fuel, oil, meals and lodging,

mobilization and de-mobilization, and warranty of workmanship as required to install and remove temporary Overhead Feeds, remove existing street light poles as required, install new street light poles and associated underground cables/conduits, all in accordance with the requirements specified in the tender documents.

E43.3 Work Locations

E43.3.1 The proposed street light installation and removals are shown on construction drawings and are as follows:

(a) Creek Bend Road to the South of the Structure.

E43.4 Coordination of Work

E43.4.1 The Contractor shall provide a minimum of ten (10) working days notice to Manitoba Hydro prior to the start of construction. The work shall be conducted and coordinated with Manitoba Hydro in a manner to ensure street lighting is maintained at all times for the duration of the work. The construction drawings provide the Proposed Sequence of Construction.

E43.4.2 The Contractor shall obtain Work Clearance from Manitoba Hydro's Customer Service Centre(s) (CSC) affected prior to the work commencing. No additional compensation shall be paid to the Contractor for delays obtaining Work Clearance for any reason.

E43.4.3 Manitoba Hydro's CSC will provide the Limits of Approach applicable to the Contractor on the Work Clearance form.

E43.5 Orientation

E43.5.1 Prior to the commencement of the proposed work, the Contractor's crew foremen, electricians, and other key personnel shall attend one (1) day of orientation provided by Manitoba Hydro for various operations such as cable handling, cable splicing/termination, installation of street light poles, concrete bases, luminaires and various other construction standards and procedures. The Contractor will be responsible for all costs associated with personnel salaries, travel, sustenance and overheads, etc., during training.

E43.6 Pre-construction Meeting

E43.6.1 Prior to the commencement of the work, the Contractor shall attend a pre-construction meeting with Manitoba Hydro. The agenda for this meeting shall include but not be limited to the following:

(a) Reference the Contractor's Safe work Procedures;

(b) Prime Contractor;

(c) materials;

(d) sequence of construction;

(e) communication plan;

(f) any training requirements & qualifications;

(g) Drawing and Project review;

(h) a review of the Contractor's proposed work schedule; and

(i) any and all other topics of clarification that the Contractor and the Contract Administrator may wish to discuss.

E43.6.2 The Contractor's cost to attend this pre-construction meeting shall be incorporated into the unit prices for the work.

E43.7 Qualifications and Certification

E43.7.1 The Contractor's Crew Foreman, installers and other key Contractor's Personnel shall possess the necessary certification, licensing, training, experience and familiarity with safety rules, procedures and hazards relating to the work. Journeyman Power Line

Technician (PLT), Journeyman Lineman, Journeyman Cableman or Journeyman Electricians shall be required to perform portions of this work.

E43.7.2 Journeyman Power Line Technician (PLT), Journeyman Cableman and Journeyman Lineman are also required to possess a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line" issued by the Province of Manitoba.

E43.7.3 Office of the Fire Commissioner Bulletin OFC 18 – 002 dated May 23, 2018 regarding Electrician Licenses discusses the requirements for a "Limited Specialized Trade Licence – 'M-P' Licence – Power Line".

For more information contact:
Office of the Fire Commissioner
500-401 York Avenue
Winnipeg, Manitoba R3C 0P8
Tel. 204-945-3373
Fax 204-948-2089
Toll Free: 1-800-282-8069
firecomm@gov.mb.ca

E43.7.4 Licensed Journeyman Electricians or Journeyman PLT or Journeyman Cableman or Journeyman Lineman ARE REQUIRED for all cable handling operations included but not limited to: disconnecting cables in the handhole, installation and removal of temporary overhead feeds, installation and connection of ground rods, streetlight cable splices, termination of streetlight cables in handholds and at luminaires. The Contractor shall employ sufficient qualified personnel on its crews to conform to the Electrician's Licensing Act. The Contractor shall be prepared to provide proof of licences to Manitoba Hydro upon request.

E43.7.5 The Contractor shall assess the hazards associated with the work and have documented Safe work Procedures to perform the work. It is the Contractor's responsibility to train employees on these procedures. The Contractor shall be prepared to provide proof of training to Manitoba Hydro upon request.

E43.8 Referenced Standard Construction Specifications

E43.8.1 In addition to these Specifications, the work to be performed by the Contractor relative to the installation and/or replacement of street lighting poles, concrete bases and associated cabling shall be in accordance with the following:

(a) Manitoba Hydro 66kV and Below Standards;

(b) CSA C22.3 No. 7 (latest edition);

(c) Canadian Electrical Code (CEC) Part 1 (latest edition); and

(d) Any other applicable codes

(e) (collectively, the "Standards")

E43.8.2 Revisions and updates to the Manitoba Hydro 66kV and Below Standards are issued periodically and the latest issued version of the Standard will apply. For the convenience of the Contractor for bidding purposes, excerpts of the Manitoba Hydro 66kV and Below Standards have been included as Appendix C.

E43.8.3 In some cases, Municipal, Provincial or Federal laws or this Technical Specification may be more stringent than the CSA Standards. Whenever conflict exists, the Contractor shall comply with the most stringent requirements applicable at the place of the work.

E43.9 Tools, Equipment and Materials

E43.9.1 The Contractor shall be required to provide all tools and equipment required for performing the specified tasks. Equipment shall be in good operating condition, shall be properly maintained using original equipment manufacturer replacement parts and shall be provided with letters of testing/inspection from the manufacturer when requested. Where the

equipment is provided as a kit with multiple parts and tools, the kit shall be complete with all parts required to perform the designed task. Contractor fabricated tools or equipment will not be accepted for use.

E43.9.2 The Contractor shall obtain the following specific Electrical Equipment including but not limited to:

(a) Compression tool or tools and associated dies to perform compressions to a maximum size of 1/0 Al (MD-6 compression tools shall not be used).

(b) Approved compression tools are:

Manufacture	Type	Model No.	Range
Burndy	In-line, battery	PATMD68-14V	350 Kcmil AL
Cembre	In-line, battery	B54Y (06V081E)	4/0 AWG AL
Burndy	Pistol, battery	BUR PAT60018V	350 Kcmil AL

E43.9.3 Dies shall be of the type shown in Standard CD210-21 and CD 210-24 only, must have identical markings, and compression tool die must match die number stamped on connector.

(a) Modiewark Model #4444 or Fluke 1AC-II Volt Alert potential Indicator

(b) Voltage meter – Fluke model #T3C

(c) Insulated wire cutters – used for cutting cable ends square.

E43.9.4 Alternative equipment manufacturers may be considered upon request by the Contractor and shall be approved for use by Manitoba Hydro prior to use.

E43.9.5 Manitoba Hydro may reject any tools or equipment that do not appear to be in good condition or fail to successfully provide the required function.

E43.10 Material Supplied by Manitoba Hydro

E43.10.1 Manitoba Hydro shall supply all street light poles, concrete bases, breakaway bases, luminaires, street light arms, ground rods, compression sleeves, grommets, nuts, electrical cables, conduits, relays, cable guards, Gel-caps and all other materials noted in the Standards. The Contractor shall sign receipts indicating the location on which the materials are to be used. The material shall be picked up by the Contractor from the following locations:

E43.10.2 Manitoba Hydro Central Stores (contact personnel will be provided to the successful Contractor).

E43.10.3 Materials requested will be supplied to the Contractor by Manitoba Hydro upon presentation of Manitoba Hydro's Stores Material Order Form. The Contractor shall assume all responsibilities for the loading, unloading, transportation, proper handling, secure storage and working of the materials and shall make replacements at its own expense in case any material is damaged, stolen or lost due to improper handling, storage or poor workmanship.

E43.10.4 The Contractor shall, at the time of materials release, check and confirm the quantity of materials. Shortages, discrepancies, or damages to materials shall be immediately reported in writing to Manitoba Hydro.

E43.10.5 After commencing performance of the work, the Contractor shall continually monitor all material required for the timely completion of the work and shall report additional material requirements to Manitoba Hydro a minimum of 72 hours prior to materials being required to perform the work. No additional compensation shall be paid as a result of delays due to material shortages where additional material requirements were not reported a minimum of 72 hours prior to being required for the work on an active project.

E43.11 Material Supplied by Contractor

E43.11.1 The Contractor shall be responsible to furnish gravel, sand, ¾" down limestone, ¼" down limestone, protective hose (i.e. typically 2" fire hose), duct seal and pit-run material for backfilling around street light poles and around cables as per the Standards. The cost of furnishing the above listed materials shall be incorporated into the unit prices for the work.

E43.12 Surplus, Reclaim and Scrap Material

E43.12.1 Upon completion of the work, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores, all Surplus materials furnished by Manitoba Hydro and not used in the work, regardless of the location of said material at that time.

E43.12.2 In addition, the Contractor shall, at its own expense, deliver to Manitoba Hydro Central Stores all Reclaim materials from the work specifically HPS luminaires. Manitoba Hydro shall be responsible for the proper disposal of Reclaim HPS luminaires. The HPS bulb shall remain installed and unbroken in the Reclaim luminaire. The Contractor shall handle the Reclaim luminaires with care and shall avoid breaking the bulb or refractor.

E43.12.3 Manitoba Hydro's preference is to recycle as much Scrap Material as practicable. The Contractor is responsible to remove the Scrap Material, transport to the recycler or Manitoba Hydro approved disposal site, pay for any disposal fees and may retain any recycling value.

E43.13 De-energization and Lockout

E43.13.1 **Manitoba Hydro -** Where a standard is supplied from an Overhead Source, Manitoba Hydro's staff shall be responsible to disconnect and isolate the street light standard or standards between the standard and Overhead Source. Some street light standards may be temporarily fed from an Overhead Source. This Overhead Source shall be disconnected and removed by Manitoba Hydro staff prior to commencing with the work. The streetlight circuits will not be Locked Out by Manitoba Hydro.

E43.13.2 **The Contractor** - The Contractor shall assess the hazards associated with the work and employ its own Safe Work Procedure for the work to be performed. The Contractor's Safe Work Procedure shall include provisions that the street light circuits will not be Locked Out by Manitoba Hydro. The Contractor's Safe Work Procedure shall achieve Lock Out or techniques equivalent to Lock Out.

E43.13.3 The Contractor shall complete a job planning form (an example is included as Appendix G) on a daily basis before any work commences and provide Manitoba Hydro with copies of the job plans if requested.

E43.14 Temporary Overhead Feeds

E43.14.1 Manitoba Hydro in consultation with the Contractor will determine if temporary lighting will be provided by the existing street lights or from the new street lights.

E43.14.2 When using the existing poles for temporary lighting, Manitoba Hydro shall remove an Overhead Source in accordance with E43.13, prior to the Contractor installing a #4 duplex overhead conductor between the existing poles. The #4 duplex overhead conductor will normally be attached to the tenon of the davit arm near the luminaire with a pre-form grip. Older poles may require a spool insulator be attached to the pole using a pre-form grip to support the #4 duplex overhead conductor. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.

E43.14.3 When using the new poles for temporary lighting, the Contractor shall install the new bases, poles and #4 duplex overhead conductor. The #4 duplex overhead conductor will be attached to the tenon of the davit arm near the luminaire with a pre-form grip. A short length of 2C/#12 copper conductor is connected to the terminals of the luminaire brought out and connected to the #4 duplex overhead conductor. The final span to the Overhead Source shall be installed by Manitoba Hydro.

E43.14.4 All material used to provide the temporary overhead feed shall be returned to Manitoba Hydro. Care shall be taken to coil and tag Reclaim conductor for reuse. If used, insulators shall be handled carefully to prevent breakage.

E43.15 Safe Excavation

E43.15.1 The work shall be performed in accordance with the requirements of Manitoba Hydro's Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix D and Manitoba Workplace Safety and Health Regulation 217 latest revision.

E43.16 Safe Handling

E43.16.1 The Contractor shall apply handling techniques in accordance with Manitoba Workplace Health and Safety Regulation 217 (latest revision).

E43.17 Electric Cables and Conduits

E43.17.1 The Contractor shall use diligent care and proper equipment in handling of all cables, so as not to injure the jacket and avoid gouging, kinking, scratching or abrading the cables. If any material is damaged to any extent, the Contractor shall repair the damages at its own expense, in a manner approved by Manitoba Hydro or will be charged the full cost of the damaged items.

E43.17.2 Cable reels shall not be dropped and must be handled and placed/stored in an upright position at all times and shall not be laid flat for any purpose or reason. Cable reels shall be adequately supported on hard surface to prevent the reel from sinking into the ground that can cause undue stress on the cables. Cable reels should be inspected for damages prior to use. If a cable reel is found to be defective, such defect shall be reported immediately to Manitoba Hydro.

E43.17.3 The Contractor shall place all material and string the cables in such a manner as to cause the least interference with normal use of the land, street or roadway. All material shall be unloaded in a manner to preserve its condition, prevent loss and/or theft and permit easy access for Manitoba Hydro's inspection.

E43.17.4 The Contractor shall provide Manitoba Hydro's inspector sufficient opportunity, in the sole discretion of Manitoba Hydro, to inspect the work.

E43.18 Precast Concrete Bases

E43.18.1 The Contractor shall handle, store, transport and unload the precast concrete bases in a manner to prevent damage to the threaded bolts and conduit casing.

E43.18.2 Precast Concrete Bases are extremely heavy. Approximate weight of pre-cast concrete bases are found in the Standards. The Contractor shall only use equipment rated for such weight.

E43.19 Street Light Poles and Arms

E43.19.1 The Contractor shall handle, store, transport, and provide proper load securement for the poles and arms in a manner to prevent damage.

E43.20 Luminaires

E43.20.1 The Contractor shall handle, store, transport and unload the luminaires in their original packaging and in a manner to prevent damage.

E43.21 Small Material

E43.21.1 Photo electric cells, shorting caps, shims, nut covers and associated supplies shall be kept in a suitable warehouse provided by the Contractor at its own expense. Photo electric cells shall be transported and stored in such a manner as to prevent breakage.

E43.22 Care Of Materials

E43.22.1 The Contractor shall assume all responsibilities of all the materials and shall replace, at its own expense, any materials damaged, stolen or lost due to improper handling or poor workmanship.

E43.23 Wire and Cable Reel Storage

E43.23.1 Cable reels shall be stored with the flanges upright and resting on a hard surface. At temporary storage sites where the soil may be soft, preservative-treated plywood sheets may be used to keep the flanges from sinking into the ground.

E43.23.2 If cable reels must be pancaked or stored on their side in vertical racks, do not lift the reel by the top flange. Spacers (two 2 X 4s placed wide side up) should be placed under the bottom flange and between the reels in order to create a space to insert the forks and lift the reels without damaging the cable.

E43.24 Reel Handling

E43.24.1 When off-loading reels from a truck, reels shall be lowered using a hydraulic gate, hoist or forklift truck. When a reel is rolled from one point to another, care must be taken to see that the reel does not straddle objects such as rocks, pipes, curbs or wooden blocks which could damage the cable or protective covering. A reel should always be rolled on hard surfaces to avoid sinkage and in the opposite direction to the cable wraps to ensure that the reel is rolled in such a direction as to tighten the cable on the reel.

E43.24.2 When using a hoist, install a mandrel through the reel arbour hole and attach a sling. Use a spreader bar approximately 6 inches longer than the overall reel width placed between the sling ends just above the reel flanges. This will prevent bending of the reel flanges and damage to the cable.

E43.24.3 If a forklift is used to move a reel, the reel is to be approached from the flange side. Position the forks such that the reel is lifted by both reel flanges. The lift forks shall not contact the cable.

E43.24.4 Returnable reels shall be returned promptly to Manitoba Hydro Central Stores and in no case later than three (3) days after the completion of the work unless otherwise mutually agreed between the Contractor and Manitoba Hydro.

E43.25 Pressurized Water/Vacuum Excavation

E43.25.1 Pressurized water/vacuum excavation (PW/VE) shall be used to daylight all buried utilities and structures where excavation by other mechanical means would be expected to provide a physical risk to that utility or structure.

E43.25.2 The work shall be performed in accordance with the requirements of Manitoba Hydro’s Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix D.

E43.26 Removal Street Light Pole from Existing Base

E43.26.1 This shall include all work required to remove a street light pole from an existing base as set forth in this Technical Specification. The pole may be on an existing precast concrete base, steel power installed screw base or poured in place concrete base.

E43.26.2 The Contractor shall furnish all labour, supplies and materials (except as indicated in E43.10) necessary for the removal of the street light pole from the existing base. Care shall be taken to preserve the luminaire. The luminaire shall be reinstalled on the new street light pole or returned to Manitoba Hydro's stores as instructed by the Manitoba Hydro.

E43.26.3 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.

E43.27 Removal Of Base and Direct Buried Street Light Pole

E43.27.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to remove a base or direct buried street light pole. The base may be poured in place concrete, steel power installed or precast concrete.

E43.27.2 The Contractor shall be responsible to transport all Surplus and Reclaim materials to Manitoba Hydro Central Stores and transport and dispose of all Scrap material as set forth in this Specification.

E43.27.3 The Contractor is responsible to supply all backfill material as specified in the Standards and carry out all backfill, compacting and leveling of all excavations and voids for removed bases and direct buried street light poles so as to be ready for top soil and seed or sod or as directed by Manitoba Hydro.

E43.28 Installation of Foundation - Concrete Base

E43.28.1 This shall include all excavation, whether by auger, pressurized water/vacuum excavation, by hand, or by other methods which may be necessary to replace or install a concrete base as set forth in this Specification.

E43.28.2 The Contractor shall furnish all labour, supplies and material (except as indicated in E43.10) necessary to install a new or replace a concrete base. Excavation for the precast concrete base shall be to a diameter and depth specified in Standard CD 300-6. All excess material is to be removed by the Contractor.

E43.28.3 The concrete base shall be set on a bed of ¾" down limestone. The concrete base backfill material shall be compacted in lifts no more than 150 mm. Backfill material shall be ¾" down limestone. Compacting of backfill material shall be done using a hydraulic tamper. Alternative tamping methods shall be approved by Manitoba Hydro. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and a layer of sand surrounding the cables to protect it from the limestone. The concrete base shall be installed level in all 4 directions. Final grade must be established prior to installing the concrete bases.

E43.28.4 The completed backfill shall be at least equal in compaction to undisturbed soil, as required by the Municipal authorities or elsewhere in this Specification. The Contractor shall level all excavations.

E43.28.5 Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface. Placing of additional backfill material due to settlement shall be at the Contractor's expense.

E43.28.6 The concrete base shall be oriented in the proper direction to allow the easy entrance of the underground cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. The cable shall be left long enough to extend one (1) metre beyond the top of the hand hole.

E43.29 Base Mounted Street Light Poles

E43.29.1 This shall include all work required to install the street light pole on the concrete base as set forth in this Specification.

E43.29.2 The Contractor shall furnish all labour, supplies and material (except as indicated in E43.10) necessary for the installation of the pole (straight shaft or davit) on the concrete base.

E43.29.3 Unless otherwise specified on the construction drawings, the Contractor shall orient the poles so that the hand hole is on the left side of the pole when viewed from the road. A worker should be able to see oncoming traffic when working in the hand hole.

E43.29.4 The Contractor shall level the street light pole in all 4 directions. Leveling shims may be used.

E43.29.5 Tightening of bolts shall be performed in a manner that brings the surfaces up evenly. All nuts shall be tightened and torqued in accordance with Standard CD 300-9. The Contractor shall install the nut covers included with the pole.

E43.29.6 Unless otherwise specified, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.

E43.29.7 Existing street light poles may have street signs attached. The Contractor shall remove the signs from the existing pole and temporarily reattach the signs to the new pole. The Contractor shall notify Manitoba Hydro of the location where the signs have been removed.

E43.30 Luminaires and Associated Wiring

E43.30.1 The Contractor shall furnish labour, supplies and material (except as indicated in E43.10) necessary to install the luminaire and associated wiring. Unless otherwise specified, the luminaire shall be installed with a tilt of zero (0) degrees. The Contractor shall install a length of 2 conductor No. 12 gauge (2C-12) wire from the terminals of the luminaire, through the arm (if applicable), down the pole to the hand hole. One (1) metre of 2C-12 wire shall be left at the hand hole. Impact equipment (air or electric) shall not be used to tighten luminaire mounting bolts. The Contractor shall be liable for damage due to over tightening.

E43.30.2 The Contractor shall verify the luminaire voltage matches the source voltage as shown on the construction drawings. If luminaire voltage does not match the source voltage, the Contractor shall re-wire the luminaire in accordance with the wiring diagram provided. NOTE: Not applicable for LED luminaires.

E43.30.3 As specified on the construction drawings, the luminaire will require either a photo electric cell (PEC) or shorting cap installed. When installing the PEC the eye shall be oriented north. The Contractor shall also install the appropriate wattage bulb in the luminaire. NOTE: Bulb installation not applicable for LED luminaires.

E43.31 Break Away Bases

E43.31.1 Break away bases shall be installed in accordance with Standard CD 300-10. The height of the concrete base above grade shall not exceed 50mm. The surface of the concrete base shall be flat and level. A reaction plate shall be installed between the concrete base and the break-away base.

E43.31.2 The Contractor shall torque the couplers in accordance with Standard CD 300-10. Impact tools shall not be used to tighten or torque couplers or nuts associated with a break away base.

E43.32 Splicing/Connecting Cables

E43.32.1 The electric cable shall be spliced/terminated as per Standards CD 215-12, CD 215-13, CD 310-1, CD 310-4, CD 310-9 and CD 310-10 with the exception that the Contractor will use a GELCAP-SL-2/0 splice kit (See Appendix E). Termination in the hand hole may include the installation of an inline fuse holder.

E43.32.2 The Contractor shall furnish all labour, supplies and material (except as indicated in E43.10) necessary to splice/terminate the street light conductor(s).

E43.33 Excavation

E43.33.1 The Contractor shall furnish all labour, supplies and material (except as indicated in E43.10) necessary for the completion and maintenance of grade and line of the street light cables and conduit including water control if found to be necessary. The trench shall be graded to conform to the street light cables and conduit so that the street light cables and conduit rest firmly on a smooth surface throughout its length. All stones or other objects which, in the opinion of Manitoba Hydro might damage the street light cable jacket and conduit shall be removed. Where the presence of rock or other condition prevent a satisfactory bed for the cables, 150 mm of well-tamped, clean soil or ¼” down crushed limestone shall be placed in the bottom of the trench. In this case, the spoil bank from

trenching operations shall not be allowed to fall into the trench or mix with the soil to be used in backfilling the trench. Loose debris or foreign matter and the spoil bank shall be placed so as not to hinder drainage, damage property, or obstruct traffic.

E43.33.2 Trenches shall be dug to such a depth that will provide a minimum cover of 600 mm from final grade in sodded areas and 1000 mm in roadways in accordance with Standard CD 305-1.

E43.34 Laying Cables

E43.34.1 Cables are to be lowered in the trench in an orderly fashion so as to maintain a consistent path and straight alignment. All cables shall be lowered in a continuous run (NO SPLICING) and in accordance with the construction drawings; and shall maintain the necessary separation, where required. All cables shall be of continuous runs and capped and sealed if they are not being installed in the pole at that time. Cables shall not be dragged over paved surfaces.

E43.34.2 Once a cable is cut its ends must be sealed immediately with an approved and appropriately sized, heat shrink or cold shrink sealing cap to prevent moisture ingress unless the cable is being installed in the pole at that time.

E43.34.3 During the removal of the cable, the reels shall be placed on jacks, stands or trailers with a bar through the arbour holes which will allow the reel to be turned easily, and the cable to be paid out. Cables can be paid out from the bottom or the top of the reel. Cable in coils shall be handled in a similar manner. This can be achieved by supporting the coil in a vertical plane and rotating it by hand as the cable is carefully uncoiled. The cable shall never be pulled over the flange of a reel, or pulled off the side of a coil, since this will introduce a twist in the cable.

E43.34.4 During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards.

E43.34.5 Where specified in the Standards or on the construction drawings, the Contractor shall install the street light cable in a conduit.

E43.35 Installing Conduit and Cable by Boring (Horizontal Directional Drilling)

E43.35.1 The Contractor shall dig the approaches and openings necessary to install boring equipment, and the boring equipment used shall be of such a nature as to minimize the opening size required. The boring equipment shall produce a straight hole without unnecessary dips or bends. The bore hole shall be only slightly larger than the outside diameter of the conduits or cables to minimize possible settlement. Cables and conduits shall be pulled in with pulling eyes or using a kellum grip in a manner so as to guard against damage.

E43.35.2 During construction as the drill bit crosses each existing facility a lookout shall be assigned by the Contractor to visually confirm the drill bit is maintaining a minimum 300 mm clearance from the existing facility all in accordance with Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix D. Maximum pulling tensions on any streetlight cable shall be limited to 2.9 kN/0.65 kips.

E43.35.3 Drilling fluids and associated waste materials shall be disposed of in a manner that minimizes environmental effects.

E43.35.4 The Contractor shall properly compact the backfill material and will be responsible for placing additional material should settlement occur for the duration of the warranty period.

E43.36 Buried Utility Crossings

E43.36.1 All buried obstructions are not necessarily shown on the reference drawings and the locations of those indicated are approximate only.

E43.36.2 The Contractor shall determine the location of all buried obstructions and shall notify the appropriate authorities and obtain all necessary permits prior to excavation, trenching and

directional drilling near or across such obstructions. All buried obstructions where the new buried cable route crosses other utilities including but not limited to gas, water, sewer, telephone and electric lines shall be exposed as per each utilities guidelines by the Contractor, including the use of Pressurized Water/Vacuum Equipment (PW/VE) where necessary. Should any damage occur to such lines during the course of the work, the Contractor shall be responsible for the damage and the costs of repairs to buried obstructions caused by its operations and shall fully indemnify the City of Winnipeg and Manitoba Hydro from and against all claims arising out of such damage. Manitoba Hydro Safe Excavation and Safety Watch Guidelines (latest revision) included as Appendix D shall be followed when crossing natural gas pipelines and electrical cables by the directional boring method.

E43.36.3 The PW/VE technique, used to expose underground plant in certain conditions, must be performed in accordance with each utility's requirements, including but not limited to Manitoba Hydro, Manitoba Telecom Services, Shaw Cable, etc. PW/VE costs that the Contractor will incur during the work must be factored into the Contractor's bid prices. The Contractor shall not be entitled to extra compensation for the use of PW/VE on the work.

E43.36.4 The Contractor shall be responsible to supply all backfill material and carry out all backfill, compacting and leveling of all excavations so as to be ready for topsoil and seed or sod or as directed by Manitoba Hydro.

E43.37 Bending Cables/Conduits and Installation into Standards

E43.37.1 It is desired to reduce to a minimum the required number of bends and to lay the cables/conduits to conform to the contour of the ground and maintain a normal covering. This shall be accomplished by cutting the trench slightly deeper in approaches to road crossings and drainage ditches. It is intended that the Contractor shall eliminate unnecessary bending by operating the trenching machine at various depths rather than by finishing grading the trench by hand whenever practical.

E43.37.2 Sharp bends of the cables/conduits shall be avoided at all times. All bends shall meet the requirements set out in this Specification. If excessive bending was exerted on any cable, the cable shall be replaced at the Contractor's cost. During installation, under no circumstance is the cable to be subjected to a bending radius tighter than that detailed in the Standards. At street light poles the Contractor shall install the ends of the cables into the plastic pipe preinstalled in the concrete base. Care shall be taken to prevent damage to the insulation or jacket of the conductors. Underground cables entering the concrete base shall be protected by a length of protective hose supplied by the Contractor and by a layer of sand surrounding the cables to protect it from the limestone. The cable shall be left long enough to extend one (1) metre beyond the hand hole. The street light cable in the trench shall be installed in conduit for mechanical protection and the ends sealed with duct seal supplied by the Contractor. Care shall be taken to prevent damaging the cable where it exits the conduit. The conduit shall only be installed into the concrete base if conduit sizes make it practicable.

E43.37.3 Unless otherwise directed, excess underground cable and 2C-12 wire shall be left inside the hand hole with the hand hole cover loosely installed.

E43.38 Backfill

E43.38.1 All backfilling material within 300 mm of the cables/conduits shall be clean, free of sod, vegetation, organic material, stones or other debris, and of a consistency as to not create significant voids or air spaces around the cables/conduits. Other backfilling material shall be free of stones greater than 150 mm on their maximum dimension. Where cinders or very acid soil are encountered or where gravel or incompressible fill is required by Municipal authorities, ¼" down crushed limestone shall be placed all around the cables for a depth of at least 300 mm. The completed backfill shall be at least equal in compaction to undisturbed soil or as directed by Manitoba Hydro. Backfill material is to be placed and compacted in lifts not exceeding 300 mm. All excess material is to be removed by the Contractor.

E43.38.2 Tamping or flushing methods must be used where necessary to give the required compaction. Where tamping is used, hand tampers shall be used to at least 300 mm above the cable before machine tamping may be used. The Contractor shall level all excavations so as to be ready for topsoil and seed or sod or as directed by the Manitoba Hydro. Should settlement occur in the excavation and cause a depression in the surface, the Contractor shall repair the surface to the satisfaction of the Manitoba Hydro at the Contractor's cost.

E43.38.3 Excavations remaining where poles have been removed shall be backfilled with spoil, pit run gravel or ¾" down limestone and compacted in lifts of 150mm as directed by Manitoba Hydro. The top 300 mm of the excavation shall be backfilled with topsoil.

E43.38.4 Excavations remaining where utility crossings have been exposed shall be backfilled with sand or clean spoil and compacted in lifts of 150mm. The top 300 mm of the excavation shall be backfilled with topsoil.

E43.38.5 Backfill of all excavations shall be in accordance with City of Winnipeg Standard Construction Specification CW 2030 (latest revision), to the satisfaction of the authority having jurisdiction and Manitoba Hydro.

E43.39 Defective Work & Warranty

E43.39.1 If any portion of the work fails to comply with the requirements of this Specification, fails within the Warranty period, or if the final tests prove or indicate the existence of any fault or defect in the work, or any part thereof, Manitoba Hydro may forthwith re-execute or make good the faulty or defective work or alter the same to make it comply with requirements of the Specification at the Contractor's expense. Manitoba Hydro shall give the Contractor notice together with particulars of such failure, fault or defect, Manitoba Hydro's cost to re-execute or make good the faulty or defective work and the Cost shall be deducted from the Contract.

E43.39.2 At the completion of the work for each location, Manitoba Hydro shall prepare and issue a Network Commissioning Report, a sample of which is included as Appendix H, to the Contractor. The Network Commissioning Report shall be dated indicating the commencement of the Warranty period for the work performed at the location.

E43.40 As-Built Drawing

E43.40.1 The Contractor shall provide an as-built drawing or mark-up drawing to Manitoba Hydro which accurately displays the "as-built" location of the buried street light cables, conduits and street light poles.

E43.41 Measurement and Payment

E43.41.1 Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for "Removal of 25' to 35' street light pole and precast, poured in place concrete, steel power installed base or direct buried including davit arm, luminaire and appurtenances". The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the pole, base, luminaire, appurtenances, use of pressurized water/vacuum excavation, transportation of Reclaim, Surplus and Scrap material, payment of associated disposal fees and all other items incidental to the work included in the Specification.

E43.41.2 Installation of 50 mm Conduit by Boring Method complete with Cable Insertion (#4 AL C/N or 1/0 AL Triplex)

(a) This pay item will be measured on a linear metre basis and paid for at the Contract Unit Price per linear metre for "Installation of 50 mm conduit or conduits by boring method complete with cable insertion (#4 AL C/N or 1/0 AL Triplex)." The number of meters to be paid for at the Contract Unit Price shall be measured and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein

described including installation of 50mm conduit or conduits by boring method, inserting the #4 AL C/N or 1/0 AL Triplex streetlight cable into the conduit(s), buried utility crossings, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E43.41.3 Installation of 25'/35' Pole, Davit Arm and Precast Concrete Base Including Luminaire and Appurtenances

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of 25'/35' pole, davit arm and precast concrete base including luminaire and appurtenances.” The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installation of the pole, davit arm, base, luminaire, appurtenances, placing the cable(s) into the base, use of pressurized water/vacuum excavation and all other items incidental to the work included in the Specification.

E43.41.4 Installation of One (1) 10' Ground Rod at Every Third Street Light, at the End of a Street Light Circuit or Anywhere Else as Shown on the Design Drawings. Trench #4 Ground Wire up to 1 m From Rod Location to New Street Light and Connect (Hammerlock) to Top of Ground Rod

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation of one (1) 10' ground rod at every third street light, at the end of a street light circuit or anywhere else as shown on the design drawings. Trench #4 ground wire up to 1 m from rod location to new street light and connect (hammerlock) to top of the ground rod.” The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including install one (1) 10’ ground rod, trench the #4 ground wire to the new streetlight pole, connect (hammerlock) ground wire to rod and all other items incidental to the work included in the Specification.

E43.41.5 Installation of Lower 3 m of Cable Guard, Ground Lug, Cable Up Pole, and First 3 M Section of Ground Rod Per Standard CD 315-5

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Install/lower 3 m of Cable Guard, ground lug, cable up pole, and first 3 m section of ground rod per Standard CD 315-5”. The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including installing the lower section of cable guard, ground lug, ground rod, coiling cable(s) up the pole and all other items incidental to the work included in the Specification.

E43.41.6 Installation and Connection of Externally-Mounted Relay and PEC Per Standards CD 315-12 and CD 315-13

(a) This pay item will be measured on a unit basis and paid for at the Contract Unit Price per unit for “Installation and connection of externally-mounted relay and PEC per Standards CD 315-12 and CD 315-13”.The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including mounting the relay, PEC, wiring as per the schematic and all other items incidental to the work included in the Specification.

E43.41.7 Installation of Overhead Span of #6 Duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed

(a) This pay item will be measured on per span basis and paid for at the Contract Unit Price per span for “Installation of Overhead Span of #6 duplex Between New or Existing Streetlight Poles and Connect Luminaire to Provide Temporary Overhead Feed”. The number of units to be paid for at the Contract Unit Price shall be verified and accepted by Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including attachment of the #6 duplex overhead conductor using a perform grip (c/w spool insulator(s) to davit arm if necessary),

sagging conductor, connection of luminaire using 2C#12 copper conductor and all other items incidental to the work included in the Specification.

E43.41.8 Removal of Overhead Span of #6 Duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed

(a) This pay item will be measured on a per span basis and paid for at the Contract Unit Price per span for “Removal of Overhead Span of #6 duplex Between New or Existing Streetlight Poles to Remove Temporary Overhead Feed”. The number of units to be paid for at the Contract Unit Price shall be verified and accepted by the Manitoba Hydro. The Price shall be payment in full for performing all operations herein described including removal of the #4 duplex overhead conductor, spool insulator(s) and all other items incidental to the work included in the Specification.

APPENDIX A: GEOTECHNICAL REPORT

APPENDIX B: HYDROTECHNICAL REPORT

APPENDIX C: MANITOBA HYDRO STREETLIGHT STANDARDS

APPENDIX D: MANITOBA HYDRO'S SAFE EXCAVATION AND SAFETY WATCH GUIDELINES

APPENDIX E: GELCAP-SL-2/0 SPLICE KIT DOCUMENT

APPENDIX F: SAMPLE ELECTRIC AND/OR NATURAL GAS FACILITIES LOCATE FORM

APPENDIX G: MANITOBA HYDRO SAMPLE JOB PLAN

APPENDIX H: MANITOBA HYDRO SAMPLE NETWORK COMISSIONING REPORT