THE CITY OF WINNIPEG

TENDER

TENDER NO. 295-2025

Lagimodiere Twin Overpasses Over CPKC Keewatin Rehabilitation and Related Works: Contract 2 – Bridge Structures, Roadworks, and Land Drainage

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – BRIDGE STRUCTURES, ROADWORKS, AND LAND DRAINAGE

B1. SUBMISSION DEADLINE

B1.1 The Submission Deadline is 12:00 noon Winnipeg time, September 16, 2025.

B1.2 The Contract Administrator or the Manager of Purchasing may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B1.1.

B2. SITE INVESTIGATION

B2.1 Further to C3.1, the Bidder may view the Site without making an appointment.

B2.2 The Bidder is advised that at no time can the Bidder access any other private owned property including CPKC right-of-way unless authorized by the Contract Administrator in writing.

B2.3 The Bidder is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid or their performance of the Work and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection.

B3. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D6.1.

B3.2 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.

B3.3 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.

B3.4 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.

B3.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

B3.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B4. CONFIDENTIALITY

B4.1 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.

B4.2 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.

B5. ADDENDA

B5.1 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.

B5.2 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.

B5.3 Addenda will be available on the MERX website at www.merx.com.

B5.4 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.

B5.5 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.

B5.6 Notwithstanding B3, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D6.

B6. SUBSTITUTES

B6.1 The Work is based on the Plant, Materials and methods specified in the Tender.

B6.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B6.3 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.

B6.4 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.

B6.5 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.

B6.6 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.

B6.6.1 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.

B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B6.8 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 B17.

B6.9 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.

B7. BID COMPONENTS

B7.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

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

B7.2 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.

B7.3 The Bid shall be submitted electronically through MERX at www.merx.com.

B7.3.1 Bids will **only** be accepted electronically through MERX.

B7.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8. BID

B8.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.

B8.2 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.

B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.

B8.3 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.

B8.4 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.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.

B8.5 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.

B9. PRICES

B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B9.1.1 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D48. Any such costs shall be determined in accordance with D48.

B9.2 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.

B9.3 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.

B9.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B9.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B9.5.1 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B9.6 Form B: Prices is organized into Parts: Part 1 of the Work and Part 2 of the Work. Bidders shall provide a total price for each Part and, on the summary sheet, a Total Bid Price consisting of the sum of prices for Part 1 and Part 2.

B10. DISCLOSURE

B10.1 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.

B10.2 The Persons are:

(a) Vector Construction
  (i) Information related to the design, supply, and installation of FRP Girder Strengthening

(b) Rakowski Cartage and Wrecking.
  (i) Information regarding the methodology and constructability of the demolition of the existing bridge

(c) Canam Bridges.
  (i) Information related to the design, supply, and installation of proposed bridge pot bearings

B11. CONFLICT OF INTEREST AND GOOD FAITH

B11.1 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.

B11.2 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.

B11.3 In connection with their Bid, each entity identified in B10.2 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.

B11.4 Without limiting B11.3, 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.

B11.5 Without limiting B11.3, 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 B11.4 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.

B11.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in their sole discretion.

B12. QUALIFICATION

B12.1 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.

B12.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B12.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

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

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

(d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B12.5 and D8); and

(e) have previously performed construction work within the right-of-way (ROW) of a Class 1 railway in Canada — meaning within the boundaries of land owned or operated by a federally regulated railway company such as CN or CP — including activities requiring coordination with railway authorities, compliance with access and safety protocols, and scheduling construction activities to avoid disruption to active railway operations; and

(f) staff this project with supervisory individuals who have successfully carried out scheduling construction activities around railway traffic that is consistent with the proposed methods detailed in the Specifications.

B12.4 Further to B12.3(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, Purchasing Division website at http://www.winnipeg.ca/matmgt/.

B12.5 Further to B12.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at Accessibility Training for anyone that may have any interaction with the public on behalf of the City of Winnipeg.

B12.6 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.

(a) Further to B13.5, proof of compliance with the requirements of B12.3(e) and B12.3(f) shall include the background experience of the bidding firm and the qualifications of the key personnel proposed for the Work. Experience shall be detailed with a description of previous works, their relevance to the rehabilitation work that is to be undertaken within the CPKC right-of-way, and references (current name, phone number, and e-mail address) to confirm the details presented. Key personnel shall be clearly identified with supporting resumes of experience and project-specific references for each relevant project. Key personnel shall include the site superintendent responsible for the Method Statement and Shop Drawing Submission.

B12.7 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.

B13. BID SECURITY

B13.1 The Bidder shall include in their Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available at: https://www.winnipeg.ca/media/4929/.

B13.2 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 B13.2(a).

B13.3 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 B17.1(a).

B13.4 Bonds passing the verification process will be treated as original and authentic.

B13.4.1 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.

B13.5 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.

B13.6 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.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

B14.1 Bids will not be opened publicly.

B14.2 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.

B14.3 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.

B14.4 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).

B14.4.1 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, Section 18, or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B15. IRREVOCABLE BID

B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B15.2 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.

B16. WITHDRAWAL OF BIDS

B16.1 A Bidder may withdraw their Bid without penalty prior to the Submission Deadline.

B17. EVALUATION OF BIDS

B17.1 Award of the Contract shall be based on the following bid evaluation criteria:

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

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B6.

B17.2 Further to B17.1(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.

B17.2.1 Any bid with an apparent imbalance between the unit prices in Part 1 and Part 2 may be determined to be non-responsive and rejected by the Award Authority in their sole discretion, acting reasonably.

B17.3 Further to B17.1(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.

B17.4 Further to B17.1(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.

B17.4.1 Further to B17.1(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.

B17.4.2 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B18. AWARD OF CONTRACT

B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B18.2 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.

B18.2.1 Without limiting the generality of B18.2, 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.

B18.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2026 Capital Budget. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.

B18.4 The City may, at their discretion, award the Contract in phases. (Part 1 and Part 2).

B18.4.1 Further to B18.4, the City reserves the right to award future phase to the successful Bidder.

B18.5 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D48 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B18.6 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 B17.

B18.6.1 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.

B18.7 As noted in D3 and identified in Form B: Prices, the Work of Part 2 will be contingent upon City Council approving funding for the Work. If sufficient funding for Part 2 Work is not approved by City Council, the City shall have the right to not award all or any portion of Part 2 Work in accordance with D2.

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, Purchasing Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. FORM OF CONTRACT DOCUMENTS

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

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of the rehabilitation of Lagimodiere Twin Overpasses over CPKC Keewatin Subdivision/Concordia Avenue, embankment widening of the bridges approaches including slope stabilization, Lagimodiere Boulevard pavement renewals from Almey Avenue to Grassie Boulevard including the interchange exit/entrance ramps, pavement renewals on eastbound Concordia Avenue from Molson Street to Peguis Street, new active transportation pathways and drainage upgrades.

D3.2 The Work to be done under the Contract will consist of two parts:

(a) Part 1 – 2026 City Funded Works

(b) Part 2 – 2027 City Funded Works

D3.3 Part 1 – 2026 City Funded Works will consist of:

(a) Southbound bridge structure rehabilitation

(b) Mobilization/Demobilization (Part 1)

D3.4 Part 2 – 2027 City Funded Works will consist of:

(a) Northbound Bridge Structure Rehabilitation works

(b) Overhead Sign Structure

(c) Southbound Lagimodiere Rehabilitation and Widening (Grassie to southerly construction limit)

(d) Southbound Exit and Entrance Ramps Rehabilitation

(e) Northbound Lagimodiere Rehabilitation (southerly construction limit to approximately 20+800 and from approximately station 22+000 to northerly construction limit)

(f) Northbound Lagimodiere Rehabilitation and Widening (from approximately station 20+800 to approximately station 22+000)

(g) Northbound Exit and Entrance Ramps

(h) Lagimodiere Active Transportation Path Construction (Reenders to Ravelston West)

(i) Concordia Active Transportation Path Construction (Molson to Peguis)

(j) Concordia Rehabilitation and Urbanization (various sections)

(k) Mobilization/Demobilization (Part 2)

D3.5 The City currently has no approved funding in the Capital Budget for Part 2 of the Work but is anticipating receiving funding approval by March 31, 2026. Part 2 of the Work is contingent upon the City Council approving sufficient funding.

D3.5.1 Further to C7.1, if notice of sufficient funding is not received, the City shall have the right to not award Part 2.

D3.5.2 If Part 2 is eliminated pursuant to D3.5.1, the time periods stipulated in D27 for Substantial Performance of the Work and in D28 for Total Performance of the Work will be reduced proportionally by the Contract Administrator acting reasonably.

D3.6 The major components of the Work are as follows:

(a) Provision of temporary traffic control including development and submission of Traffic Management Plans for approval by the Contract Administrator.

(b) Bridge Structure Rehabilitation

(i) Complete removal and disposal of existing reinforced concrete bridge deck, traffic barriers, approach slabs, diaphragms at abutment/pier locations (intermediate diaphragms to remain), and slope paving;

(ii) Remove and dispose of existing utility conduits and hangers.

(iii) Complete removal and disposal of existing bridge expansion joints, and bridge bearings;

(iv) Removal and salvaging of existing aluminum barrier rail and aluminum barrier rail and posts;

(v) Supply and installation of stainless steel reinforcing bars and black steel reinforcing bars;

(vi) Jack-up and temporarily support bridge superstructure;

(vii) Drilling and grouting steel reinforcing dowels;

(viii) Supply and installation of new bridge bearings;

(ix) Complete abutment repairs including concrete removals, concrete repairs/modifications, and overlay construction;

(x) Complete pier repairs including construction of new reinforced concrete pier cap collars;

(xi) Prestressed concrete girder repairs and FRP strengthening;

(xii) Supply and install grade beam steel piles;

(xiii) Supply and install bridge electrical;

(xiv) Cast new reinforced concrete bridge deck, traffic barriers, approach slabs, street light pedestals and slope paving;

(xv) Installation of street (bridge) lighting (by others)

(xvi) Place bridge deck waterproofing and protection system;

(xvii) Construction of asphalt overlay on bridge;

(xviii) Supply and install grade beam expansion joints;

(xix) Railway Protection and Related Requirements

(c) Overhead Sign Structure

(i) Remove and dispose of existing bridge overhead sign structure and foundations;

(ii) Construct reinforced concrete pile foundation

(iii) Supply and install structural steel cantilever overhead structure.

(iv) Supply and install sign panel.

(d) Lagimodiere Rehabilitation including interchange ramps:

(i) Removal and salvage of aluminum balanced barrier guardrail system

(ii) Removal of high-mast street light (By Others)

(iii) Stripping and stockpiling topsoil

(iv) Excavating and filling of embankments

(v) Placement of suitable fill to widen embankment

(vi) Relocating street lighting (by others)
(vii) Excavating and stockpiling, placing granular, and capping for granular ribs
(viii) Installation of catch basins and outlet pipe
(ix) Removal of curb
(x) Planing of asphalt overlay (mainline only) as follows:
- Lagimodiere mainline average thickness – 50mm
- Lagimodiere mainline inside shoulder average thickness – 50mm
- Lagimodiere mainline outside shoulder average thickness – 30mm
- Lagimodiere ramps outside shoulder average thickness – 10 mm
- Concordia mainline average thickness –10mm

(xi) Repair of full depth concrete existing slabs and joints
(xii) Planing and patching of existing transverse concrete joints and covering with glasgrid
(xiii) Planing or removing shoulder asphalt
(xiv) Sealing longitudinal joints and bridging with glasgrid
(xv) Placing granular on milled asphalt surface within base sandwich area
(xvi) Renewing existing curb utilizing slip form paving equipment
(xvii) Constructing concrete median and drainage troughs
(xviii) Installing rip-rap aprons
(xix) Placing asphalt on lanes
- Mainline average thickness – 60 mm (Type SP1)
- Mainline (base sandwich area) average thickness – 150 mm (three lifts of Type SP1)
- Ramp average thickness – 50 mm (Type MS1)

(xx) Placing asphalt on shoulders
- Mainline reconstructed average thickness – 100 mm (two lifts of Type MS-1))
- Mainline rehabilitated average thickness (inside) – 60 mm (Type SP-1)
- Mainline rehabilitated average thickness (outside) – 40 mm (Type MS-1)
- Mainline rehabilitated average thickness (inside – base sandwich area) – 100 mm (two lifts of Type SP-1)
- Mainline rehabilitated average thickness (outside – base sandwich area) – 100 mm (two lifts of Type MS-1)
- Mainline rehabilitated average thickness (outside – base sandwich area less than 2 m width) – 100 mm (two lifts of Type SP-1)
- Ramp reconstructed average thickness – 100 mm (two lifts of Type MS-1)
- Ramp rehabilitated average thickness – 60 mm (Type MS-1)

(xxi) Placing gravel on shoulders
(xxii) Installing guardrail systems and end treatments (temporary and permanent)
(xxiii) Removal of detour roadways
(xxiv) Placing topsoil and seed or sod (some seeding locations By Others)
(xxv) Performing reflective crack maintenance

(e) Lagimodiere and Concordia Pathways Construction
(i) Hydro-excavation of utilities
(ii) Relocating fire hydrants
(iii) Relocate Shindico sign
(iv) Remove trees

(v) Relocation of guy wires (by others)
(vi) Relocation of traffic signal (by others)
(vii) Stripping topsoil
(viii) Excavating and filling of embankments
(ix) Installing land drainage sewers, culverts, catchbasins and manholes
(x) Compacting sub-grade
(xi) Install primary fee power cable (by Others)
(xii) Placing geotextile, sub-base, geogrid,and base course material
(xiii) Install curb
(xiv) Install sidewalk
(xv) Install Transit Stop
(xvi) Placing asphalt (Type MS-1)
(xvii) Installing CSTEs for pathway lighting
(xviii) Installing pathway lighting
(xix) Installing fencing
(xx) Placing topsoil, seed or sod, and erosion control blanket
(xxi) Performing reflective crack maintenance

(f) Concordia Eastbound Rehabilitation and Urbanization
(i) Excavating
(ii) Installing catchbasins and leads
(iii) Compacting sub-grade
(iv) Placing geotextile, sub-base, geogrid,and base course material for widening
(v) Planing of asphalt overlay on widening
(vi) Placing curb and gutter
(vii) Placing splash strip
(viii) Constructing composite to concrete transition slab
(ix) Placing asphalt, thickness varies 50 mm – 100 mm (two lifts of Type-MS 1)
(x) Removal of detour roadways
(xi) Re-installing aluminum balanced barrier
(xii) Placing topsoil, seed or sod

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) "**API**" means American Petroleum 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.

(c) "**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.

(d) "**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.

(e) **"Construction Plan"** is a formal submission to CPKC for their review which details the proposed construction works, schedule and completion methodology. The Construction Plan is required for all Works within, over or near the CPKC right-of-way.

(f) **"Contract 1"** is defined as Tender No. 294-2025 Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related Works: Contract 1 – Temporary Pavement Works. Issued for Tender drawings are available on the City of Winnipeg Purchasing website. Issued for Construction drawings are available by request through the Contract Administrator.

(g) **"Contract 2"** is defined as Tender No. 295-2025 Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related Works: Contract 2 – Bridge Structures, Roadworks, and Land Drainage.

(h) "**CPKC**" means Canadian Pacific Kansas City railway company, their agents, or designated representatives.

(i) "**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.

(j) "**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.

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

(l) **"Method Statement"** is a detailed, project-specific document prepared by the Contractor that outlines the proposed approach to executing the Work, including the sequence of operations, equipment to be used, safety protocols, environmental protection measures, and coordination procedures with third parties such as railway authorities. The Method Statement shall demonstrate how the Contractor intends to meet the performance requirements of the Contract while minimizing disruption to railway operations and ensuring compliance with applicable safety standards and access protocols.

(m) **"NB", "SB", "WB", "EB"** refers to northbound, southbound, eastbound, and westbound respectively, and refer to the direction of vehicular travel along roadways as designated in the Contract Drawings and as commonly understood in the local transportation context. These terms are used to describe the orientation of traffic flow, construction elements, and staging throughout the Contract Documents.

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

(o) "**Payment Certification**" means the Contract Administrator's statement of the sums certified to be paid by the City to the Contractor with reference to its interim and final progress estimates and/or the Contractor's Proper Invoice;

(p) "**Proper Invoice**" means the definition within *The Builders' Liens Act*, R.S.M. 1987, c. B91 and any subsequent amendments thereto, and also includes the criteria to be included in an invoice, as set out in the Measurement and Payment provisions of the Contract;

(q) "**Protecting Foreman**" means the CPKC employee or Contractor employee qualified in the Canadian Rail Operation Rules (CROR) and CPKC requirements. Protecting Foremen are responsible for protecting employees against Railway traffic. Protecting Foremen are charged solely with the safe movement of trains and are not responsible for the safety of the Contractor, the Contractor's personnel or the Contractor's equipment.

(r) "**ROW**" **(Right-of-Way)** means land reserved for transportation or utility purposes. This term may refer to:

- The **City of Winnipeg right-of-way**, which includes roads, sidewalks, pathways, and utility corridors under municipal jurisdiction; and
- The **CPKC right-of-way**, which refers to lands owned or controlled by Canadian Pacific Kansas City (CPKC) for the operation and maintenance of railway infrastructure.

The specific meaning of "ROW" shall be interpreted based on context; where related to railway operations or coordination with CPKC, it shall mean the CPKC right-of-way.

(s) "**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.

(t) **"Shop Drawing Submission"** refers to a compilation of drawings, diagrams, schedules, and other data prepared by the Contractor or Subcontractors and submitted to the Contract Administrator for review. Shop Drawings illustrate the details of specific portions of the Work, including fabrication, installation, and interface with existing infrastructure. For work within the railway right-of-way, Shop Drawing Submissions shall also reflect any requirements or approvals from the railway authority and must align with the approved Method Statement.

(u) **"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.

(v) "**The Builders' Liens Act**" or "**the BLA**" means *The Builders' Liens Act*, R.S.M. 1987, c. B91 and any subsequent amendments thereto.

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

(x) **"Track Block"** means a preapproved, by CPKC, set timeframe trains will not operate on the railway tracks.

D6. CONTRACT ADMINISTRATOR

D6.1 The Contract Administrator is Tetra Tech Canada Inc., represented by:

Jeff Crang, P.Eng., PTOE
Senior Transportation Engineer

Telephone No. 431-554-5718
Email Address jeff.crang@tetratech.com

D6.2 At the pre-construction meeting, the Contract Administrator 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 format only.

SUBMISSIONS

D11. AUTHORITY TO CARRY ON BUSINESS

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

D12. SAFE WORK PLAN

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

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

D12.3 Notwithstanding B12.4 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 City shall provide and maintain the following owner controlled insurance coverage to remain in place as outlined below. The City reserves the right to add, delete, revise and redefine insurance requirements and deductibles at any time, at its sole discretion, or as necessitated by market conditions and/or extension of the insurance policies during the term of the Project :

D13.1.1 All risks course of construction insurance in the amount of one hundred percent (100%) of the total contract price. Such policy shall be written in the joint names of the City, Contractor and subcontractors including testing and commissioning, if required, and shall remain in place until the date of Substantial Performance. The Contractor shall be responsible for deductibles a minimum of up to $100,000 except for flood and water damage losses subject to $150,000 deductible.

D13.1.2 Wrap Up Liability insurance in an amount of no less than fifty million dollars ($50,000,000) inclusive per occurrence and fifty million dollars ($50,000,000) general aggregate covering bodily injury, personal injury, damage to existing structure, sudden and accidental pollution liability, shall not exclude operations on or in the vicinity of the railway right of way, no xcu exclusions, hook liability, property damage and products and completed operations consistent with industry *standard insurance wordings. Wrap Up Liability insurance to also include evidence of contractual liability and cross liability clauses.*

(a) The Contractor shall be responsible for deductibles a minimum of $50,000 maximum any one loss.

(i) The City will carry such insurance to cover the City, Contractors, and Subcontractors as insured's. Provision of this insurance by the City is not intended in any way to relieve the Contractor from his obligations under the terms of the Contract. Specifically, losses relating to deductibles for insurance, as well as losses in excess of limits of coverage and any risk of loss that is not covered under the terms of the insurance provide by the City remains with the Contractor.

(ii) BellMTS, Manitoba Hydro, Shaw and Telus shall be shown as additional insured, as required by contract, if applicable. Manitoba its ministers officers employees and agents, and CP Indemnified Group to be added as an additional insured.

(iii) Wrap-up liability insurance shall be maintained from the date of the commencement of the Work until the date of Total Performance of the work and shall include an additional twenty-four (24) months completed operations coverage which will take affect after Total Performance.

D13.2 The Contractor shall provide and maintain the following insurance coverage at all times during the performance of the Work and throughout the warranty period:

(a) commercial general liability insurance, in the amount of at least twenty-five million dollars ($25,000,000.00) inclusive, with The City of Winnipeg, Manitoba its ministers and officers employees and agents, and CP Indemnified Group as additional insureds, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, and confirmation that policy does not exclude

operations on or in the vicinity of the railway right of way, 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) Contractors pollution liability insurance in the amount of at least two million dollars ($2,000,000) per occurrence and two million dollars ($2,000,000) aggregate insuring against claims covering third-party injury and property damage claims and including clean up costs and transported cargo as a result of pollution conditions arising suddenly or gradually from the Contractor operations and completed operations. Such policy to name the City and CP Indemnified Group as an additional insured and remain in place throughout the warranty period;

(d) Property insurance all equipment, tools, field offices and portable toilets used by the Contractor directly or indirectly in the performance of the Work on the project that may be owned, rented, leased or borrowed.

D13.3 Deductibles shall be borne by the Contractor.

D13.4 The Contractor shall provide their experience on similar projects and five (5) year loss history on Projects and any other pertinent information needed to enable the City to place the construction insurance policies outlined in D13.1 above within five (5) business days of the request of the information

D13.5 All policies shall be taken out with insurers licensed to carry on business 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 the 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 amount of fifty percent (50%) of the Contract Price; and

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

D14.1.1 Bonds are available at:

(a) Performance Bond https://www.winnipeg.ca//media/4928/
  (i) Performance Bond – Schedule A - Form of Notice https://www.winnipeg.ca/media/4831/
  (ii) Performance Bond – Schedule B – Surety's Acknowledgement https://www.winnipeg.ca/media/4832/
  (iii) Performance Bond – Schedule C – Surety's Position https://www.winnipeg.ca/media/4833/

(b) Labour & Material Payment Bond https://www.winnipeg.ca//media/4930/
  (i) L&M Bond – Schedule A – Notice of Claim https://www.winnipeg.ca/media/4834/

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

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

D14.1.2 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

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

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

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

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

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

D14.1.3 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in their discretion, exercised reasonably, allows.

D14.1.4 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 C4.1 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 Documents, as applicable.

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) a daily manpower schedule for the Work identifying all tasks that will require coordination with the railway; and

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

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) Critical Stages as listed in D26;

(d) Substantial Performance;

(e) Total Performance;

(f) Demobilization from Site; and

(g) Landscaping Maintenance and other Maintenance.

D17.7 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.

D17.8 Further to D17.5(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

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

D17.11 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 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

(a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).

(b) How the Contractor will maintain access to bus stops within the site.

(c) How the Contractor will maintain access to pedestrian corridors and half signals.

(d) How the Contractor will maintain cycling facilities.

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

(f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.

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) Transit Stops; and

(d) 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.

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

(b) Provincial

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

(c) Municipal

(i) The City of Winnipeg By-law Neighbourhood Liveability No. 1/2008 and all amendments;

(ii) The City of Winnipeg Traffic By-law No. 1573/77 and all amendments;

(iii) City of Winnipeg Motor Vehicle Noise Policies and Guidelines;

(iv) The City of Winnipeg Sewer By-law No. 92/2010 and all amendments;

(v) Any other applicable Acts, Regulations, and By-laws and associated updates and amendments.

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 ponds, ditches, LDSs, unless written acceptance from the Contract Administrator is received in advance.

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

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

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 all fuel storage containers are inspected daily for leaks and spillage.

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

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

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

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

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

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

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

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

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

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

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

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) 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 D19.1 below) to Manitoba Sustainable Development, immediately after occurrence of the environmental accident, by calling the 24 hour emergency phone number (204) 945-4888.

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

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

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

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

(ii) Attend to public safety:

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

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

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

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

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

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

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

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

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

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

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

* Container Capacity (refers to container water capacity)

Source: Environmental Accident Reporting Regulation M.R. 439/87

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 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 D20.

(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; see Section D20 for more information on required mitigation for existing birds' nests in the Work area.

(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.

D19.3.11 Wetlands

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

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

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

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

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

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

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

D19.3.12 Vegetation

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

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

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

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

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

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

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

D19.3.13 Landscaping

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

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

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

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

D19.3.14 Heritage Resources

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

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

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

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

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

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

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

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

D19.3.15 Construction Traffic

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

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

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

(d) The Contractor’s laydown area, construction Site and access road will be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to construction areas and to control any potential hazard to the public, particularly children.

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

D19.4 Notwithstanding the measurement and payment terms of Environmental Protection Plan shall be considered incidental to the Work.

D20. ENVIRONMENTAL PROTECTION PLAN – MIGRATORY BIRDS

D20.1 In addition to the provisions outlined in D19 prior to commencing construction activities or delivery of materials to Site, the Contractor shall provide mitigation measures at the bridge site to protect barn swallows under the federal *Migratory Birds Convention Act,* a bird species that is currently listed as a ‘threatened’ species on Schedule 1 of the federal Species At Risk Act (SARA). These Acts provide legal protection to barn swallows, and contravention of these Acts can result in legal actions and monetary fines.

D20.2 The Contractor shall provide appropriate mitigation measures.

D20.3 Notwithstanding the measurement and payment terms of Environmental Protection Plan – Migratory Birds during construction, including monitoring shall be considered incidental to the 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;

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

(e) fenced laydown area locations including gates;

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

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

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

SCHEDULE OF WORK

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;

(xiii) the direct deposit application form specified in D40; and

(xiv) the Contractor's approved Traffic Management Plans in accordance with E9.

(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.

D22.3 The Contractor shall not commence any work on site on or within 25' of the CPKC ROW until the City and CPKC have entered into a Construction Agreement. It is anticipated that a Construction Agreement will be executed by December 1, 2025.

D22.4 The Contractor shall not commence any work on or within 25' of the CPKC ROW until all submissions in accordance with E41 "Rail" have been submitted and approved by the Contract Administrator and CPKC. This is to address all works within 25' of the CPKC ROW.

D22.4.1 Following receipt of the award letter, the Contractor shall prepare and submit a CPKC Workplan. See section E41 "Rail" for Workplan requirements.

D22.5 The Contractor shall not commence Part 2 of the Work as described in D3 and identified in Form B: Prices, until he/she has received notification from the Contract Administrator for Award of Contract for Part 2 of the Work.

D22.6 The City intends to award Part 1 of this Contract by November 10, 2025.

D22.7 The City intends to award Part 2 of this Contract by April 3, 2026.

D22.8 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. RESTRICTED WORK HOURS

D23.1 Further to 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

(a) It is anticipated that some stages of the Work, will require completion during these times, such as Grassie Blvd intersection which might be paved at off peak hours.

D23.2 The following work hour restrictions shall also apply:

(a) Working within CPKC ROW, Contractor working hours will be determined by the “activities requiring flagging protection” guidelines from the E41 “Rail” specification.

D24. WORK BY OTHERS

D24.1 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.

D24.2 Work by others on or near the Site will include but not necessarily be limited to:

(a) BellMTS and Rogers – relocation/protection of existing lines;

(b) CPKC with further reference to E41;

(c) Manitoba Hydro Street Lighting – Servicing of CSTEs, relocation of streetlights, and installation of permanent/temporary street lighting will be taking place throughout the Contract;

(d) Manitoba Hydro Electrical – Miscellaneous Hydro works will be taking place through the project such as relocating anchor wire (s), pedestals, and hydro distribution pole;

(e) Manitoba Hydro Gas – protection of existing lines;

(f) Winnipeg Transit – relocating bus stops;

(g) City of Winnipeg Traffic Services - Replacement of permanent signs and supply and installation of route detour signs. The Contractor is expected to cooperate with the City of Winnipeg Traffic Services to facilitate construction. Installation required throughout various Phases/Stages of the Work; Modification/installation of line painting. Installation required throughout various Phases/Stages of the Work; and

(h) City of Winnipeg Traffic Signals - Removal and modification of existing traffic signals plant and installation of new Traffic Signals plant. Specifically, the traffic within the south median at the intersections of Lagimodiere Blvd. and Grassie Blvd and Concordia Ave. and Molson St. may require relocation.

D24.3 Further to D24.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others. The Contractor must include and accommodate Work by Others identified in D24.2 or additional parties, in their construction schedule as per D17 and accommodate the necessary area on Site required for the Work by Others to complete the Work.

D25. SEQUENCE OF WORK

D25.1 Further to C6.1, the sequence of work shall be as follows:

D25.1.1 The staging as described on the Traffic Management Drawings is to be followed in the sequence as illustrated and described on the Drawings.

D25.2 Placing the topsoil and finished grading of all boulevard areas shall be completed prior to construction of asphaltic concrete overlays.

D26. CRITICAL STAGES

D26.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Southbound Exit and Entrance Ramps shall be complete and open to traffic within twenty (30) consecutive Working Days of ramp closure for both and no later than September 30, 2026.

(b) The intersection of Grassie Boulevard and Lagimodiere Boulevard and 200 m south of the intersection (both directions) shall be complete and open to traffic within ten (10) consecutive Working Days and no later than September 30, 2026. Lagimodiere Boulevard turning lanes at Grassie Boulevard shall not be closed concurrently with the Southbound Exit and Entrance Ramps.

(c) The intersection of Almey Avenue and Lagimodiere Blvd and Lagimodiere Blvd. 100 m north of the intersection (both directions) shall be complete and open to traffic within ten (10) consecutive Working Days and no later than September 30, 2026. No lane closures are to occur prior to construction of this area.

(d) Southbound Structure and all **Stage 1 Works indicated on the Traffic Management Drawings** including, but not limited to roadworks, pathways, associated Concordia drainage and lighting, shall be complete and open to traffic by October 31, 2026.

(e) Further to (d), and subject to reduced Liquidated Damages, opening of traffic on the Southbound Structure may be performed if waterproofing and asphalt paving on the bridge is not completed. In the event that the Contractor fails to complete waterproofing and asphalt overlaying of the southbound bridge, the contractor shall bear the cost of design and construction and any ongoing maintenance of temporary works such that the southbound bridge can carry two-way traffic over the winter of 2026-2027 while work progresses on the northbound structure. The design and construction of temporary work shall be subject to review and approval by the Contract Administrator. Any temporary ramping over expansion joints shall not exceed 0.7% gradient on both sides.

(f) Northbound Exit and Entrance Ramps shall be complete and open to traffic within twenty (25) consecutive Working Days of ramp closure for both and no later than September 30, 2027.

D26.2 When the Contractor considers the Work associated with each Critical Stage to be complete, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D26.3 The date on which the Critical Stage Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of that Critical Stage has been achieved.

D27. SUBSTANTIAL PERFORMANCE

D27.1 The Contractor shall achieve Substantial Performance by October 31, 2027.

D27.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D27.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D27.4 Substantial performance will be considered achieved when all four lanes of Lagimodiere Boulevard and all lanes of Concordia Avenue to be open for traffic, all pathways open to the public and all illumination working. This includes, but is not limited to the removal and restoration related to the Lagimodiere Boulevard and Concordia Avenue cross-over detours and completion of the permanent median Works that shall be completed in these areas.

D28. TOTAL PERFORMANCE

D28.1 The Contractor shall achieve Total Performance by June 30th, 2028.

D28.2 If seasonal inclement weather does not allow permanent restorations to commence immediately after Substantial Performance, the Contract Administrator will advise the Contractor when seasonal conditions allow permanent restorations to begin. The Contractor will start final restorations no later than 14 (fourteen) Calendar Days after formal notification by the Contract Administrator.

D28.3 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D28.4 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. LIQUIDATED DAMAGES

D29.1 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) Each Critical Stage as defined in D26.1 (b), (c), (d) - Twelve Thousand Dollars ($12,000.00)

(b) Each Critical Stage as defined in D26.1 (a) and (f) – Six Thousand Five Hundred Dollars ($6,500.00)

(c) Critical Stage as defined in D26.1 (e) - One Hundred Dollars ($100.00) from the date the Southbound Structure is temporarily open to traffic until the waterproofing membrane and asphalt are complete and the bridge is permanently open to traffic.

(d) Substantial Performance – Twelve Thousand Dollars ($12,000.00);

(e) Total Performance – Three Thousand Five Hundred Dollars ($3,500.00).

D29.2 The amounts specified for liquidated damages in D29.1 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. Without diminishing the Contractor’s obligations or the City’s powers anywhere else in this Contract, the Liquidated

Damages represent the City's sole financial remedy for delays in the Contractor's achievement of Substantial Performance or Total Performance under this Contract and shall not exceed the sum of $12,000.00 per Calendar Day of delay.

D29.3 If the Contractor fails to achieve the Critical Stage as defined by the date specified in D26.1 (d) liquidated damages, as specified in D30.4, shall accrue for each Calendar Day until this Critical Stage is completed and open to traffic. These damages shall apply independently of and concurrently with any other damages stipulated in the Contract.

D29.4 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D30. ACCELERATED COMPLETION

D30.1 This Specification shall cover the accelerated completion of the Works of this Contract.

D30.2 At no risk to the City, the Contractor at his own initiative, means, and expense may undertake to complete the Works of this Contract to facilitate the safe reopening of traffic following Critical Stage D26 specified here:

(a) In recognition of the fact that an early completion of Critical Stage D26.1(d) is of benefit to the City, the City will compensate the Contractor for said early completion on a per calendar day unit price basis, as hereinafter set out, provided that the City will not be liable to pay for any period of acceleration in excess of thirty (30) days.

(b) It is noted that certain delays during construction are normal, due to site conditions, necessary layout and dimensional changes. The Contract Administrator will attempt to resolve the situation as soon as possible. The Contractor is advised that no extension to time will be given for events of this sort which cause construction delays.

(c) It is noted that Work by Others will be ongoing during the Work in accordance with Section D24 "Work By Others". Coordination and accommodation of work by Others shall be considered integral and incidental to the work and no extension of time will be given for delays related to coordination and/or accommodation of work by Others.

(d) The final determination of compensable acceleration or delay shall be at the sole discretion of the Contract Administrator.

D30.3 Method of Measurement

(a) Subject to Clause D30.2 hereof, accelerated completion will be measured on a unit basis per calendar day. The number of calendar days to be paid for will be the total number of full calendar days which the Southbound Bridge structure is ready to receive two-way traffic (not including setup of traffic control material) in advance of the Critical Stage(s) specified herein, with all specified Works completed acceptable to the Contract Administrator.

D30.4 Basis of Payment

(a) Subject to Clause D30.2 hereof, accelerated completion will be paid for at the Unit Price per calendar day specified hereinafter for "Accelerated Completion" which price shall be payment in full for performing all operations undertaken and all other items incidental to the Work included in this Specification. The Unit Price for Accelerated Completion shall be one thousand dollars ($1,000.00) per calendar day.

(b) Payment for this item is not identified on Form B: Prices, and shall not be included thereon. If accelerated completion does occur as specified herein, then payment will be made for this item as a change to the Contract.

D31. SEASONAL SHUTDOWN

D31.1 Notwithstanding C6.30 and C18.1(d), the contractor is permitted one seasonal shutdown during the course of the contract.

D31.2 The seasonal shutdown is only permitted to occur after Critical Stage defined in D26.1(d) and Substantial Completion is achieved.

D31.3 During the seasonal shutdown, traffic on Lagimodiere Boulevard must be returned to a safe operating condition with two (2) lanes in each direction. Contractor shall submit a temporary traffic control plan and drawings in accordance with Standard Construction Specification CW 1130, E9 and E8.

D31.4 Provide notice in writing to the CA a minimum of 14 (fourteen) Calendar Days in advance of the start of the proposed seasonal shutdown.

D31.5 Contractor will remain in full care and control of the work for the Site, including all temporary works.

D31.6 Contractor will remain responsible for general security of the Site.

D31.7 Contractor will remain responsible to satisfy all railway requirements.

D32. SUPPLY CHAIN DISRUPTION SCHEDULE DELAYS

D32.1 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.

D32.2 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.

D32.3 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 ordering of Material or Goods, production and/or manufacturing schedules or availability of staff as appropriate.

D32.4 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 D32.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D32.5 The Work schedule, including the durations identified in D23 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.

D32.6 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.

D32.7 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.

D33. CPKC DELAYS

D33.1 Delays caused by Canadian Pacific Kansas City (CPKC), including but not limited to lack of track availability or Protecting Foreman access, shall be considered Force Majeure events as defined under C16 of the General Conditions. The Contractor shall promptly document any such delay in writing and submit to the Contract Administrator for review. Time extensions, where applicable, shall be administered in accordance with C16. No liquidated damages will apply to affected Critical Stages during an accepted Force Majeure period.

D34. SCHEDULED MAINTENANCE

D34.1 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) Seed maintenance as specified in CW 3520;

(c) Reflective crack maintenance during the warranty period as specified in CW 3520.

D34.2 Determination of 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

D35. JOB MEETINGS

D35.1 Regular weekly job meetings will be held at Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one (1) representative of the City and one (1) representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D35.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

D36. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D36.1 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).

D37. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D37.1 Further to B12.4, 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 B12.4.

D38. LAYOUT OF STRUCTURAL WORKS

D38.1 The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Structural Work.

D38.2 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.

D38.3 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 his discretion.

D38.4 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 his own expense.

D38.5 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 replaced by the Contract Administrator at the expense of the Contractor.

D39. LAYOUT OF SURFACE AND UNDERGROUND WORKS

D39.1 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.

D39.2 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 planing 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.

D39.3 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.

D39.4 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.

D39.5 The Contractor shall determine and provide all dimensions and elevations measured from the stakes or marks.

INVOICES, MEASUREMENT AND PAYMENT

D40. PAYMENT

D40.1 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.

D40.2 C12.2 is deleted and replaced with the following:

C12.2 The amounts to be paid by the City to the Contractor shall be as set out in the Payment Certification. In the event the Payment Certification does not align with the Contractor's Proper Invoice and payment by the City to the Contractor is not made, or not going to be made, for the invoiced amount within 28 Calendar Days of receipt of the Proper

Invoice, the City will issue a notice of non-payment to the Contractor in accordance with the BLA.

C12.2.1 For unit price Contracts, such sums shall be determined by the Contract Administrator upon the basis of the unit prices for the various classes of the Work stated on Form B: Prices. The total amount to be paid to the Contractor for the Work will be the amount arrived at by measuring the amount of each class of the Work listed on Form B: Prices and performed in accordance with the Contract, and pricing the same, in accordance with the unit prices stated thereon.

C12.2.2 For lump sum Contracts, such sums shall be determined by the Contract Administrator upon the basis of the lump sum price stated on Form B: Prices, if applicable, but in any event the lump sum price broken down into the percentage completed for each portion of the Work, commonly referred to as detailed prices.

D40.3 C12.7 to C12.15 are deleted and replaced with the following:

C12.7 After the end of each month, the Contractor shall submit a Proper Invoice including documentation that details the type, quantity and value of Work performed during the previous month, in accordance with C12.2.

C12.8 The Contract Administrator will review the Proper Invoice and produce its Payment Certification accordingly.

C12.9 Any payment made by the City to the Contractor on account of a Proper Invoice shall be less any holdback required to be made by The Builders' Liens Act, and such holdbacks or other amounts which the City is entitled to withhold pursuant to the Contract.

C12.10 If in the Contractor's opinion the Work performed during the previous month is minimal or does not warrant an invoice, the Contractor is permitted to not submit an invoice on the condition that the Contractor advises the Contractor Administrator in writing.

C12.11 Unless agreed to by the Contract Administrator, in writing, on an exception basis, the Contractor shall not submit invoices more frequently than monthly.

C12.12 Any reference to payment submittals or payment processes in the NMS Sections of the Contract are deleted and replaced with the payment submittals and payment processes within Section C12 of the General Conditions, as amended by the Supplemental Conditions.

FINAL PAYMENT

C12.13 The Contractor shall indicate on its invoice if it is the final invoice for Work performed under the Contract. Payment Certification, in response to receipt of the final Proper Invoice by the Contractor, shall be subject to the following conditions:

(a) issuance by the Contract Administrator of a certificate of Total Performance;

(b) receipt by the City of a certificate from the Workers Compensation Board stating that full payment has been made to the Board with respect to all assessments owing.

C12.14 Payment on account of the holdback made by the City pursuant to The Builders' Liens Act, shall be paid to the Contractor when the time for filing liens or trust claims has elapsed, unless the City is in receipt of a lien or trust claim.

C12.15 Neither the issuance of a certificate of Total Performance nor the payment of the final Proper Invoice shall relieve the Contractor from their responsibilities either under C13 or as a result of any breach of the Contract by the Contractor including, but not limited to,

defective or deficient Work appearing after Total Performance, nor shall it conclude or prejudice any of the powers of the Contract Administrator or the Chief Administrative Officer hereunder.

C12.16 Subject to C12.17, acceptance by the Contractor of payment on account of the final Proper Invoice shall constitute a waiver and release by them of all claims against the City whether for payment for Work done, damages or otherwise arising out of the Contract.

C12.17 If the Contractor disputes a Payment Certification related to a notice of non-payment by the City to the Contractor in accordance with the BLA, the Contractor may appeal the determination of the Contract Administrator to the Chief Administrative Officer as provided for in C21. If prior to the appeal being concluded, the Contractor gives a notice of adjudication to the City pursuant to the BLA, the appeal process will be discontinued.

D41. INVOICES

D41.1.1 Further to C12, the Contractor:

(a) shall submit invoices for work performed during the previous calendar month in accordance with the instructions on the City's website at: https://legacy.winnipeg.ca/finance/corporate-accounts-payable.stm; and

(b) should copy the Contract Administrator on submission of its invoice.

D42. PAYMENT SCHEDULE

D42.1 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.

D43. FUEL PRICE ADJUSTMENT

D43.1 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.

D43.1.1 Eligible Work will be determined in accordance with D43.5.

D43.1.2 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.

D43.1.3 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.

D43.1.4 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.

D43.2 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.

D43.3 The fuel escalation or de-escalation adjustment will not be applied if the CFI is within ±15% of the BFI.

D43.4 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.

D43.5 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.

ADJUSTMENTS FOR CHANGES IN LAWS, TAXES OR TARIFFS

D44. ADJUSTMENTS FOR CHANGES IN LAWS, TAXES OR TARIFFS

D44.1 Further to C12.4 and subject to C6.13, the Contract Price shall be adjusted if any change in a law or tax imposed under the Excise Act, the Excise Tax Act, the Customs Act, the Customs Tariff, The Mining Tax Act (Manitoba), or The Retails Sales Tax Act (Manitoba), by an act of the Congress of the United States of America, or by Executive Order by the President of the United States under the International Emergency Economic Powers Act of the United States of America or similar legislation:

(a) Occurs after the Submission Deadline;

(b) Applies to Material; and

(c) Affects the cost of the Material to the Contractor.

D44.2 Further to C12.5, if a change referred to the C12.4 occurs, the Contract Price shall be increased or decreased by an amount equal to the amount that is established, by an examination of the relevant records of the Contractor, to be the increase or decrease in the cost incurred that is directly attributable to that change, and which the Contractor has proven to the Contract Administrator represents the minimum amount of increase necessary in order to obtain necessary Material or Plant. For the avoidance of doubt, the Contractor shall be required to provide satisfactory proof that it has investigated alternative options for obtaining equivalent Material or Plant and reducing or eliminating the increase in Contract Price, up to and including entering into purchase agreements with vendors located in other jurisdictions, in order for Contractor to be able to avail itself of the increase in Contract Price permitted.

WARRANTY

D45. WARRANTY

D45.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire: (a) one (1) year thereafter for Regional Street asphalt rehabilitation (mill & fill); (b) two (2) years thereafter for structural works (including bridge structures), pavement reconstruction, and pathway construction works; unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D45.1.1 For the purpose of contract security, the warranty period shall be two (2) years.

D45.2 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.

D45.2.1 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

D46. DISPUTE RESOLUTION

(a) 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 D46.

D46.2 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted"

D46.3 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 Purchasing 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.

D46.4 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.

D46.4.1 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.

D46.4.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.

D46.4.3 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.

D46.4.4 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 D46.4.3, 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

D47. INDEMNITY

D47.1 Indemnity shall be as stated in C17.

D47.2 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.

D47.3 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

D48. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D48.1 Funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D48.2 For the purposes of D48:

(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.

D48.3 Indemnification By Contractor

D48.3.1 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.

D48.3.2 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.

D48.4 Records Retention and Audits

D48.4.1 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.

D48.4.2 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 D48.4.1 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.

D48.5 Other Obligations

D48.5.1 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.

D48.5.2 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.

D48.5.3 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.

D48.5.4 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.

D48.5.5 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.

D48.5.6 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.

LIMITATION OF LIABILITY AND WAIVER OF CONSEQUENTIAL DAMAGES

D49. Limitation Of Liability And Waiver Of Consequential Damages

D49.1 Notwithstanding C17, the indemnities under C17 this Contract shall not apply and there shall be no right to claim damages for breach of this Contract, in tort or on any other basis whatsoever to the extent that loss claimed by either Party is:

(a) for punitive, exemplary or aggravated damages; or

(b) for loss of profit (but does not include the Parties' rights to payments expressly provided for in this Contract), loss of use, loss of production, loss of business, claims of customers or loss of business opportunity.

D49.2 Subject to D49.3 and D49.5, the maximum aggregate liability of:

(a) Contractor in respect of indemnity obligations to the City pursuant to C17.1 shall not exceed the amount of twice the Contract Price or five million dollars ($5,000,000), whichever is greater:

(i) up to a maximum of ten million dollars ($10,000,000) where the Contract Price is twenty million dollars ($20,000,000) or less, or

(ii) to a maximum of twenty million dollars ($20,000,000) in all other cases.

D49.3 The limits set out in D49.2 shall be exclusive of any insurance proceeds received or which will be received pursuant to policies maintained in accordance with this Contract, or which would have been received if the Contractor had complied with its obligation to insure under this Contract or the terms of any policy of insurance required under this Contract each in the "not less than" value as set out in the Contract; and shall not apply in cases of gross negligence or wilful misconduct.

D49.4 The Contractor's obligation to indemnify the City pursuant to C17.1 shall only be triggered in the event that said costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken are brought as a result of negligent acts or omissions of the Contractor, their Subcontractors, employees or agents in the performance or purported performance of the Work; or from breach of this Contract by same; or from wilful misconduct by same.

D49.5 For the avoidance of doubt, the above limitations shall not apply to any obligations of the Contractor to indemnify third parties as required by applicable funding agreements pursuant to D47.

FORM J: SUBCONTRACTOR LIST
(See D15)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

Portion of the Work	Name	Address
STRUCTURAL WORKS:		
Supply of Materials		
Structural Concrete		
Stainless Steel Reinforcing		
Pot Bearings		
Expansion Joints		
FRP Girder Strengthening		
Overhead Sign Structure		
Reflective Guide Sign Panel		
Install/Placement		
Structural Removals		
Temporary Bridge Jacking		
Structural Concrete		
Reinforcing		
Pot Bearings		
Expansion Joints		
FRP Girder Strengthening		
Steel Overhead Sign Support Structures		
Under-bridge Lighting		
Miscellaneous Metal		
Overhead Sign Structure		
SURFACE WORKS:		
Supply of Materials		
Concrete		
Asphalt		
Imported Fill		

FORM J: SUBCONTRACTOR LIST
(See D15)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

Portion of the Work	Name	Address
Base Courses & Sub-base Course		
Glasgrid Materials		
Geotextile Materials		
Sub-drain Pipe		
ET-31 End Treatment		
Steel Beam Guardrail		
Crash Attenuation Barriers		
Crash Attenuation Barrels		
Detectable Warning Surface Tiles		
Crack Sealing Material		
Install/Placement		
Asphalt Planing		
Concrete		
Asphalt		
Sub-drain Pipe, Geotextiles, Base Course, Sub-base Course		
ET-31 End Treatment		
Steel Beam Guardrail		
Crash Attenuation Barriers		
Crash Attenuation Barrels		
Fencing		
Crack Sealing		
LANDSCAPING:		
Supply of Materials		
Fencing		
Topsoil		
Sod		
Seed		

FORM J: SUBCONTRACTOR LIST
(See D15)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

Portion of the Work	Name	Address
Erosion Control Blanket		
Install/Placement:		
Fencing		
Topsoil		
Sod		
Seed		
Erosion Control Blanket		
UNDERGROUND WORKS:		
Supply of Materials		
Pipe		
Culverts		
Manholes		
Catch Pits/Ring Sections/Ditch Inlet Grates		
Other (Describe)		
Installation/Placement		
Trenchless Pipe Installations		
Other		
ELECTRICAL AND LIGHTING:		
Supply of Materials		
Pathway Lighting Standards Types “C1” & “C2”		
Pathway Lighting Standards U/G Power Feed Conduits & Cabling		
Pathway Lighting Standards U/G Power Feed Trenching & Backfilling		
Customer Service Termination Enclosures (CSTE’s)		
Under Bridge Lighting Fixtures Type “B” (Cost share with the MB Hydro)		
Under Bridge Lighting Power Conduits & Cabling (Cost share with the MB Hydro)		

FORM J: SUBCONTRACTOR LIST
(See D15)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

Portion of the Work	Name	Address
Bridge Type “A” Deck Lighting Power Conductors Conduits		
Installation/Placement		
Pathway Lighting Standards Types “C1” & “C2”		
Pathway Lighting Standards U/G Power Feed Conduits & Cabling		
Pathway Lighting Standards U/G Power Feed Trenching & Backfilling		
Customer Service Termination Enclosures (CSTE’s)		
Under Bridge Lighting Fixtures Type “B” (Cost share with the MB Hydro)		
Under Bridge Lighting Power Conduits & Cabling (Cost share with the MB Hydro)		
Bridge Type “A” Deck Lighting Power Conductors Conduits		
Demolition of Existing High Mast Lighting Standards Concrete Pile Bases		
Other		

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FORM K: EQUIPMENT
(See D16)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

1. Category/type: *Asphalt Milling*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type: *Earth Moving/Excavation*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type: *Base Placement / Compaction / Grading*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

Template Version: 2024 02 01- Const Road Works

FORM K: EQUIPMENT
(See D16)

LAGIMODIERE TWIN OVERPASSES OVER CPKC KEEWATIN REHABILITATION AND RELATED WORKS: CONTRACT 2 – OVERPASS STRUCTURES, ROADWORKS, AND LAND DRAINAGE

4. Category/type: *Concrete Slip Form Paving*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type: *Asphalt Paving*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type: *Others*

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

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

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B6. 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 B6.

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
1.0 GENERAL		
B123-25-1001	COVER SHEET	22” x 34”
B123-25-1002	LIST OF DRAWINGS	22” x 34”
B123-25-1003	LIST OF DRAWINGS	22” x 34”
B123-25-1004	DESIGN DATA AND GENERAL NOTES	22” x 34”
B123-25-1005	GENERAL LAYOUT AND SCOPE OF WORK	22” x 34”
B123-25-1006	BRIDGE REHABILITATION - EXISTING GENERAL ARRANGEMENT	22” x 34”
B123-25-1007	BRIDGE REHABILITATION - PROPOSED GENERAL ARRANGEMENT	22” x 34”
TRAFFIC MANAGEMENT PLAN-STAGE-1		
P123-25-1001	REENDERS AVE. TO STA 20+330 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1002	STA 20+340 NB TO STA 20+680 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1003	STA 20+680 NB TO STA 21+020 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1004	STA 21+020 NB TO STA 21+360 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1005	STA 21+360 NB TO STA 21+700 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1006	STA 21+700 NB TO STA 22+040 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1007	STA 22+040 NB TO STA 22+380 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1008	STA 22+380 NB TO STA 22+720 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1009	STA 22+720 NB TO NORTH OF GRASSIE BLVD LAGIMODIERE BOULEVARD	22” x 34”
TRAFFIC MANAGEMENT PLAN-STAGE-2		
P123-25-1010	SOUTH OF REENDERS AVE. TO STA 20+330 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1011	STA 20+330 NB TO STA 20+670 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1012	STA 20+670 NB TO STA 21+010 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1013	STA 21+010 NB TO STA 21+350 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1014	STA 21+350 NB TO STA 21+690 NB LAGIMODIERE BOULEVARD	22” x 34”
P123-25-1015	STA 21+690 NB TO STA 22+030 NB LAGIMODIERE BOULEVARD	22” x 34”

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P123-25-1016	STA 22+030 NB TO STA 22+370 NB LAGIMODIERE BOULEVARD	22" x 34"
P123-25-1017	STA 22+370 NB TO STA 22+710 NB LAGIMODIERE BOULEVARD	22" x 34"
P123-25-1018	STA 22+710 NB TO NORTH OF GRASSIE BLVD LAGIMODIERE BOULEVARD	22" x 34"
TRAFFIC MANAGEMENT PLAN		
P123-25-1019	NORTH OF MOLSON ST. STA 0+100 EB TO STA 0+440 EB CONCORDIA AVENUE - EB CLOSURE	22" x 34"
P123-25-1020	STA 0+440 EB TO STA 0+780 EB CONCORDIA AVENUE - EB CLOSURE	22" x 34"
P123-25-1021	STA 0+780 EB TO STA 1+040 EB CONCORDIA AVENUE - EB CLOSURE	22" x 34"
TRAFFIC MANAGEMENT PLAN		
P123-25-1022	NORTH OF MOLSON ST. STA 0+100 EB TO STA 0+440 WB CONCORDIA AVENUE - WB CLOSURE	22" x 34"
P123-25-1023	STA 0+440 EB TO STA 0+780 EB CONCORDIA AVENUE - WB CLOSURE	22" x 34"
P123-25-1024	STA 0+780 EB TO 1+040 EB CONCORDIA AVENUE - WB CLOSURE	22" x 34"
2.0 BRIDGE WORKS		
2.1 SOUTHBOUND STRUCTURE		
B123-25-2101	SOUTHBOUND STRUCTURE GENERAL ARRANGEMENT PLAN - STAGE 1	22" x 34"
B123-25-2102	SOUTHBOUND STRUCTURE GENERAL ARRANGEMENT ELEVATION AND CROSS SECTION	22" x 34"
B123-25-2103	SOUTHBOUND STRUCTURE SOUTH ABUTMENT S-0 - DEMOLITION AND REPAIR DETAILS	22" x 34"
B123-25-2104	SOUTBOUND STRUCTURE SOUTH ABUTMENT S-0 - CONCRETE DETAILS	22" x 34"
B123-25-2105	SOUTHBOUND STRUCTURE SOUTH ABUTMENT S-0 - REINFORCING DETAILS	22" x 34"
B123-25-2106	SOUTHBOUND STRUCTURE NORTH ABUTMENT S-5 - DEMOLITION AND REPAIR DETAILS	22" x 34"
B123-25-2107	SOUTHBOUND STRUCTURE NORTH ABUTMENT S-5 - CONCRETE DETAILS	22" x 34"
B123-25-2108	SOUTHBOUND STRUCTURE NORTH ABUTMENT S-5 - REINFORCING DETAILS	22" x 34"
B123-25-2109	SOUTHBOUND STRUCTURE PIER S-1 - REPAIR DETAILS	22" x 34"
B123-25-2110	SOUTHBOUND STRUCTURE PIER S-2 - REPAIR DETAILS	22" x 34"
B123-25-2111	SOUTHBOUND STRUCTURE PIER S-3 - REPAIR DETAILS	22" x 34"
B123-25-2112	SOUTHBOUND STRUCTURE PIER S-4 - REPAIR DETAILS	22" x 34"
B123-25-2113	SOUTHBOUND STRUCTURE PIER S-1, S-2, S-3, S-4 - CONCRETE DETAILS	22" x 34"
B123-25-2114	SOUTHBOUND STRUCTURE PIER S-1, S-2, S-3, S-4 - REINFORCING DETAILS	22" x 34"
B123-25-2115	SOUTHBOUND STRUCTURE BEARING LAYOUT	22" x 34"
B123-25-2116	SOUTHBOUND STRUCTURE BEARING DETAILS	22" x 34"
B123-25-2117	SOUTHBOUND STRUCTURE GRADE BEAM BEARING DETAILS	22" x 34"
B123-25-2118	SOUTHBOUND STRUCTURE GIRDER REPAIR AND STRENGTHENING LAYOUT	22" x 34"
B123-25-2119	SOUTHBOUND STRUCTURE GIRDER DIAPHRAGM DEMOLITION DETAILS	22" x 34"
B123-25-2120	SOUTHBOUND STRUCTURE GIRDER DIAPHRAGM CONCRETE DETAILS	22" x 34"

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B123-25-2121	SOUTHBOUND STRUCTURE DECK CONCRETE PLAN, SECTION AND DETAILS	22” x 34”
B123-25-2122	SOUTHBOUND STRUCTURE DECK CONCRETE DETAILS	22” x 34”
B123-25-2123	SOUTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 1 OF 5	22” x 34”
B123-25-2124	SOUTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 2 OF 5	22” x 34”
B123-25-2125	SOUTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 3 OF 5	22” x 34”
B123-25-2126	SOUTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 4 OF 5	22” x 34”
B123-25-2127	SOUTHBOUND STRUCTURE DECK BARRIER REINFORCING DETAILS SHEET 5 OF 5	22” x 34”
B123-25-2128	SOUTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 1 OF 3	22” x 34”
B123-25-2129	SOUTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 2 OF 3	22” x 34”
B123-25-2130	SOUTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 3 OF 3	22” x 34”
B123-25-2131	SOUTHBOUND STRUCTURE SOUTH APPROACH - GRADE BEAM REINFORCING DETAILS	22” x 34”
B123-25-2132	SOUTHBOUND STRUCTURE SOUTH APPROACH - STRUCTURAL SLAB REINFORCING DETAILS	22” x 34”
B123-25-2133	SOUTHBOUND STRUCTURE SOUTH APPROACH - APPROACH SLAB REINFORCING DETAILS	22” x 34”
B123-25-2134	SOUTHBOUND STRUCTURE SOUTH APPROACH – APPROACH SLAB BARRIER REINFORCING DETAILS	22” x 34”
B123-25-2135	SOUTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 1 OF 3	22” x 34”
B123-25-2136	SOUTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 2 OF 3	22” x 34”
B123-25-2137	SOUTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 3 OF 3	22” x 34”
B123-25-2138	SOUTHBOUND STRUCTURE NORTH APPROACH - GRADE BEAM REINFORCING DETAILS	22” x 34”
B123-25-2139	SOUTHBOUND STRUCTURE NORTH APPROACH - STRUCTURAL SLAB REINFORCING DETAILS	22” x 34”
B123-25-2140	SOUTHBOUND STRUCTURE NORTH APPROACH - APPROACH SLAB REINFORCING DETAILS	22” x 34”
B123-25-2141	SOUTHBOUND STRUCTURE NORTH APPROACH – APPROACH SLAB BARRIER REINFORCING DETAILS	22” x 34”
B123-25-2142	SOUTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION CONCRETE DETAILS	22” x 34”
B123-25-2143	SOUTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION CONCRETE DETAILS	22” x 34”
B123-25-2144	SOUTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION REINFORCING DETAILS	22” x 34”
B123-25-2145	SOUTHBOUND STRUCTURE BILL OF REINFORCING SHEET 1 OF 3	22” x 34”
B123-25-2146	SOUTHBOUND STRUCTURE BILL OF REINFORCING SHEET 2 OF 3	22” x 34”
B123-25-2147	SOUTHBOUND STRUCTURE BILL OF REINFORCING SHEET 3 OF 3	22” x 34”
2.2 NORTHBOUND STRUCTURE		

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B123-25-2201	NORTHBOUND STRUCTURE GENERAL ARRANGEMENT - PLAN STAGE 2	22” x 34”
B123-25-2202	NORTHBOUND STRUCTURE GENERAL ARRANGEMENT ELEVATION AND CROSS SECTION	22” x 34”
B123-25-2203	NORTHBOUND STRUCTURE SOUTH ABUTMENT N-0 - DEMOLITION AND REPAIR DETAILS	22” x 34”
B123-25-2204	NORTHBOUND STRUCTURE SOUTH ABUTMENT N-0 - CONCRETE DETAILS	22” x 34”
B123-25-2205	NORTHBOUND STRUCTURE SOUTH ABUTMENT N-0 - REINFORCING DETAILS	22” x 34”
B123-25-2206	NORTHBOUND STRUCTURE NORTH ABUTMENT N-5 - DEMOLITION AND REPAIR DETAILS	22” x 34”
B123-25-2207	NORTHBOUND STRUCTURE NORTH ABUTMENT N-5 - CONCRETE DETAILS	22” x 34”
B123-25-2208	NORTHBOUND STRUCTURE NORTH ABUTMENT N-5 - REINFORCING DETAILS	22” x 34”
B123-25-2209	NORTHBOUND STRUCTURE PIER N-1 - REPAIR DETAILS	22” x 34”
B123-25-2210	NORTHBOUND STRUCTURE PIER N-2 - REPAIR DETAILS	22” x 34”
B123-25-2211	NORTHBOUND STRUCTURE PIER N-3 - REPAIR DETAILS	22” x 34”
B123-25-2212	NORTHBOUND STRUCTURE PIER N-4 - REPAIR DETAILS	22” x 34”
B123-25-2213	NORTHBOUND STRUCTURE PIER N-1, N-2, N-3, N-4 - CONCRETE DETAILS	22” x 34”
B123-25-2214	NORTHBOUND STRUCTURE PIER N-1, N-2, N-3, N-4 - REINFORCING DETAILS	22” x 34”
B123-25-2215	NORTHBOUND STRUCTURE BEARING LAYOUT	22” x 34”
B123-25-2216	NORTHBOUND STRUCTURE BEARING DETAILS	22” x 34”
B123-25-2217	NORTHBOUND STRUCTURE GRADE BEAM BEARING DETAILS	22” x 34”
B123-25-2218	NORTHBOUND STRUCTURE GIRDER REPAIR AND STRENGTHENING LAYOUT	22” x 34”
B123-25-2219	NORTHBOUND STRUCTURE GIRDER DIAPHRAGM DEMOLITION DETAILS	22” x 34”
B123-25-2220	NORTHBOUND STRUCTURE GIRDER DIAPHRAGM CONCRETE DETAILS	22” x 34”
B123-25-2221	NORTHBOUND STRUCTURE DECK CONCRETE PLAN, SECTION AND DETAILS	22” x 34”
B123-25-2222	NORTHBOUND STRUCTURE DECK CONCRETE DETAILS	22” x 34”
B123-25-2223	NORTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 1 OF 5	22” x 34”
B123-25-2224	NORTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 2 OF 5	22” x 34”
B123-25-2225	NORTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 3 OF 5	22” x 34”
B123-25-2226	NORTHBOUND STRUCTURE DECK REINFORCING DETAILS SHEET 4 OF 5	22” x 34”
B123-25-2227	NORTHBOUND STRUCTURE DECK BARRIER REINFORCING DETAILS SHEET 5 OF 5	22” x 34”
B123-25-2228	NORTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 1 OF 3	22” x 34”
B123-25-2229	NORTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 2 OF 3	22” x 34”
B123-25-2230	NORTHBOUND STRUCTURE SOUTH APPROACH CONCRETE DETAILS SHEET 3 OF 3	22” x 34”
B123-25-2231	NORTHBOUND STRUCTURE SOUTH APPROACH - GRADE BEAM REINFORCING DETAILS	22” x 34”

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
B123-25-2232	NORTHBOUND STRUCTURE SOUTH APPROACH - STRUCTURAL SLAB REINFORCING DETAILS	22” x 34”
B123-25-2233	NORTHBOUND STRUCTURE SOUTH APPROACH - APPROACH SLAB REINFORCING DETAILS	22” x 34”
B123-25-2234	NORTHBOUND STRUCTURE SOUTH APPROACH - APPROACH SLAB BARRIER REINFORCING DETAILS	22” x 34”
B123-25-2235	NORTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 1 OF 3	22” x 34”
B123-25-2236	NORTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 2 OF 3	22” x 34”
B123-25-2237	NORTHBOUND STRUCTURE NORTH APPROACH CONCRETE DETAILS SHEET 3 OF 3	22” x 34”
B123-25-2238	NORTHBOUND STRUCTURE NORTH APPROACH - GRADE BEAM REINFORCING DETAILS	22” x 34”
B123-25-2239	NORTHBOUND STRUCTURE NORTH APPROACH - STRUCTURAL SLAB REINFORCING DETAILS	22” x 34”
B123-25-2240	NORTHBOUND STRUCTURE NORTH APPROACH - APPROACH SLAB REINFORCING DETAILS	22” x 34”
B123-25-2241	NORTHBOUND STRUCTURE NORTH APPROACH - APPROACH SLAB BARRIER REINFORCING DETAILS	22” x 34”
B123-25-2242	NORTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION CONCRETE DETAILS	22” x 34”
B123-25-2243	NORTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION CONCRETE DETAILS	22” x 34”
B123-25-2244	NORTHBOUND STRUCTURE SOUTH ABUTMENT SLOPE PROTECTION REINFORCING DETAILS	22” x 34”
B123-25-2245	NORTHBOUND STRUCTURE BILL OF REINFORCING SHEET 1 OF 4	22” x 34”
B123-25-2246	NORTHBOUND STRUCTURE BILL OF REINFORCING SHEET 2 OF 4	22” x 34”
B123-25-2247	NORTHBOUND STRUCTURE BILL OF REINFORCING SHEET 3 OF 4	22” x 34”
B123-25-2248	NORTHBOUND STRUCTURE BILL OF REINFORCING SHEET 4 OF 4	22” x 34”
2.3 BRIDGE ELECTRICAL		
B123-25-2301	BRIDGE ELECTRICAL AND LIGHTING PLAN	22” x 34”
B123-25-2302	BRIDGE ELECTRICAL AND LIGHTING DETAILS	22” x 34”
2.4 OVERHEAD SIGN STRUCTURE (OHSS)		
S568-25-2401	OVERHEAD SIGN STRUCTURE S568 PLAN, ELEVATION AND PILE FOUNDATION DETAILS	22” x 34”
S568-25-2402	OVERHEAD SIGN STRUCTURE S568 FABRICATION DETAILS	22” x 34”
3.0 DRAINAGE WORKS		
P123-25-3001	LAND DRAINAGE SEWER & DITCH MOLSON ST TO 120m SE	22” x 34”
P123-25-3002	PROPOSED DITCH ON CONCORDIA AVE STA 1+35 TO 2+80	22” x 34”
P123-25-3003	LAND DRAINAGE SEWER & DITCH ON CONCORDIA AVE. STA 2+80TO 4+00	22” x 34”
P123-25-3004	LAND DRAINAGE SEWER & DITCH ON CONCORIDA AVE. STA 4+00 TO 5+15	22” x 34”
P123-25-3005	LAND DRAINAGE SEWER & DTICH ON CONCORIDA AVE. STA 5+15 TO 6+30	22” x 34”
P123-25-3006	LAND DRAINAGE SEWER & DITCH ON CONCORDIA AVE. STA 6+30 TO 150m EAST	22” x 34”
P123-25-3007	PROPOSED CSP CULVERTS AT CONCORDIA AVE STA 1+000 TO 1+110	22” x 34”

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P123-25-3008	LAND DRAINAGE SEWER & DITCH N OF CONCORDIA AVE. STA 1+110 TO 1+230	22" x 34"
P123-25-3009	PROPOSED DRAINAGE CHANNEL & OUTLET STA 1+230 TO POND 4-15	22" x 34"
P123-25-3010	LAND DRAINAGE SEWERS DETAILS 1 OF 3	22" x 34"
P123-25-3011	LAND DRAINAGE SEWERS DETAILS 2 OF 4	22" x 34"
P123-25-3012	LAND DRAINAGE SEWERS DETAILS 3 OF 3	22" x 34"
P123-25-3013	CULVERT DETAILS	22" x 34"
P123-25-3014	BRIDGE SUBDRAIN OUTLET DETAILS	22" x 34"
4.0 SURFACE WORKS		
4.1 HORIZONTAL GEOMETRY		
P123-25-4101	KEY PLAN CONTROL LINE GEOMETRY LAGIMODIERE BLVD AND CONCORDIA AVE	22" x 34"
P123-25-4102	KEY PLAN CONTROL LINE GEOMETRY MULTI-USE PATHS AND INTERCHANGE RAMPS	22" x 34"
P123-25-4103	CONTROL LINE GEOMETRY LAGIMODIERE BLVD (1 OF 3)	22" x 34"
P123-25-4104	CONTROL LINE GEOMETRY LAGIMODIERE BLVD (2 OF 3)	22" x 34"
P123-25-4105	CONTROL LINE GEOMETRY LAGIMODIERE BLVD (3 OF 3)	22" x 34"
P123-25-4106	CONTROL LINE GEOMETRY CONCORDIA INTERCHANGE SB EXIT RAMP	22" x 34"
P123-25-4107	CONTROL LINE GEOMETRY CONCORDIA INTERCHANGE NB ENTRANCE RAMP	22" x 34"
P123-25-4108	CONTROL LINE GEOMETRY CONCORDIA INTERCHANGE SB ENTRY RAMP SB EXIT RAMP - LEFT TURN	22" x 34"
P123-25-4109	CONTROL LINE GEOMETRY CONCORDIA INTERCHANGE NB EXIT RAMP	22" x 34"
P123-25-4110	CONTROL LINE HORIZONTAL GEOMETRY CONCORDIA AVE (1 OF 2) MOLSTON ST TO PEGUIS ST	22" x 34"
P123-25-4111	CONTROL LINE HORIZONTAL GEOMETRY CONCORDIA AVE (2 OF 2) MOLSTON ST TO PEGUIS ST	22" x 34"
P123-25-4112	CONTROL LINE HORIZONTAL GEOMETRY MULTI-USE PATH REENDERS DR TO RAVELSTON AVE W	22" x 34"
4.2 PAVING AND GRADING		
P123-25-4201	KEY PLAN PLAN AND PROFILE LAGIMODIERE BLVD AND CONCORDIA AVE	22" x 34"
P123-25-4202	KEY PLAN PLAN AND PROFILE MULTI-USE PATH AND INTERCHANGE RAMPS	22" x 34"
P123-25-4203	LAGIMODIERE BOULEVARD - PLAN STA. 20+380 TO 20+540 (NB)	22" x 34"
P123-25-4204	LAGIMODIERE BOULEVARD - PROFILE STA. 20+380 TO 20+540 (NB)	22" x 34"
P123-25-4205	LAGIMODIERE BOULEVARD - PLAN STA. 20+540 TO 20+700 (NB)	22" x 34"
P123-25-4206	LAGIMODIERE BOULEVARD - PROFILE STA. 20+540 TO 20+700 (NB)	22" x 34"
P123-25-4207	LAGIMODIERE BOULEVARD - PLAN STA. 20+700 TO 20+860 (NB)	22" x 34"
P123-25-4208	LAGIMODIERE BOULEVARD - PROFILE STA. 20+700 TO 20+860 (NB)	22" x 34"
P123-25-4209	LAGIMODIERE BOULEVARD - PLAN STA. 30+885 TO 31+020 (SB) STA. 20+860 TO 21+020 (NB)	22" x 34"
P123-25-4210	LAGIMODIERE BOULEVARD - PROFILE STA. 30+860 TO 31+020 (SB) STA. 20+860 TO 21+020(NB)	22" x 34"

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P123-25-4211	LAGIMODIERE BOULEVARD - PLAN STA. 31+020 TO 31+180 (SB) STA. 21+020 TO 21+180 (NB)	22” x 34”
P123-25-4212	LAGIMODIERE BOULEVARD - PROFILE STA. 31+020 TO 31+180 (SB) STA. 21+020 TO 21+180 (NB)	22” x 34”
P123-25-4213	LAGIMODIERE BOULEVARD - PLAN STA. 31+180 TO 31+340 (SB) STA. 21+180 TO 21+340 (NB)	22” x 34”
P123-25-4214	LAGIMODIERE BOULEVARD - PROFILE STA. 31+180 TO 31+340 (SB) STA. 21+180 TO 21+340 (NB)	22” x 34”
P123-25-4215	LAGIMODIERE BOULEVARD - PLAN STA. 31+340 TO 31+500 (SB) STA. 21+340 TO 21+500 (NB)	22” x 34”
P123-25-4216	LAGIMODIERE BOULEVARD - PROFILE STA. 31+340 TO 31+500 (SB) STA. 21+340 TO 21+500 (NB)	22” x 34”
P123-25-4217	LAGIMODIERE BOULEVARD - PLAN STA. 31+500 TO 31+660 (SB) STA. 21+500 TO 21+660 (NB)	22” x 34”
P123-25-4218	LAGIMODIERE BLVD - PROFILE STA. 31+500 TO 31+660 (SB) STA. 21+500 TO 21+660 (NB)	22” x 34”
P123-25-4219	LAGIMODIERE BOULEVARD - PLAN STA. 31+660 TO 31+820 (SB) STA. 21+660 TO 21+820 (NB)	22” x 34”
P123-25-4220	LAGIMODIERE BOULEVARD - PROFILE STA. 31+660 TO 31+820 (SB) STA. 21+660 TO 21+820 (NB)	22” x 34”
P123-25-4221	LAGIMODIERE BOULEVARD - PLAN STA. 31+820 TO 31+980 (SB) STA. 21+820 TO 21+980 (NB)	22” x 34”
P123-25-4222	LAGIMODIERE BOULEVARD - PROFILE STA. 31+820 TO 31+980 (SB) STA. 21+820 TO 21+980 (NB)	22” x 34”
P123-25-4223	LAGIMODIERE BOULEVARD - PLAN STA. 31+980 TO 32+140 (SB) STA. 21+980 TO 22+140 (NB)	22” x 34”
P123-25-4224	LAGIMODIERE BOULEVARD - PROFILE STA. 31+980 TO 32+140 (SB) STA. 21+980 TO 22+140 (NB)	22” x 34”
P123-25-4225	LAGIMODIERE BOULEVARD - PLAN STA. 32+140 TO 32+300 (SB) STA. 22+140 TO 22+300 (NB)	22” x 34”
P123-25-4226	LAGIMODIERE BOULEVARD - PROFILE STA. 32+140 TO 32+300 (SB) STA. 22+140 TO 22+300 (NB)	22” x 34”
P123-25-4227	LAGIMODIERE BOULEVARD - PLAN STA. 32+300 TO 32+460 (SB) STA. 22+300 TO 22+460 (NB)	22” x 34”
P123-25-4228	LAGIMODIERE BOULEVARD - PROFILE STA. 32+300 TO 32+460 (SB) STA. 22+300 TO 22+460 (NB)	22” x 34”
P123-25-4229	LAGIMODIERE BOULEVARD - PLAN STA. 32+460 TO 32+620 (SB) STA. 22+460 TO 22+620 (NB)	22” x 34”
P123-25-4230	LAGIMODIERE BOULEVARD - PROFILE STA. 32+460 TO 32+620 (SB) STA. 22+460 TO 22+620 (NB)	22” x 34”
P123-25-4231	LAGIMODIERE BOULEVARD - PLAN STA. 32+620 TO 32+780 (SB) STA. 22+620 TO 22+780 (NB)	22” x 34”
P123-25-4232	LAGIMODIERE BOULEVARD - PROFILE STA. 32+620 TO 32+752.1 (SB) STA. 22+620 TO 22+780 (NB)	22” x 34”
P123-25-4233	RIGHT TURN AT GRASSIE BLVD - PROFILE STA 00+95.49 TO 00+127.48	22” x 34”
P123-25-4234	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (SB) - PLAN PROFILE STA. 3+000 TO 3+150	22” x 34”
P123-25-4235	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (SB) - PLAN PROFILE STA. 3+150 TO 3+310	22” x 34”
P123-25-4236	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (SB) - PLAN PROFILE STA. 3+310 TO 3+470	22” x 34”
P123-25-4237	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (SB) - PLAN PROFILE STA. 3+470 TO 3+630	22” x 34”

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P123-25-4238	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (SB) - PLAN PROFILE STA. 3+630 TO 3+489.37	22” x 34”
P123-25-4239	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (NB) - PLAN PROFILE STA. 1+000 TO 1+160	22” x 34”
P123-25-4240	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (NB) - PLAN PROFILE STA. 1+160 TO 1+310	22” x 34”
P123-25-4241	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (NB) - PLAN PROFILE STA. 1+310 TO 1+474.6	22” x 34”
P123-25-4242	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (SB) - PLAN PROFILE STA. 4+000 TO 4+160	22” x 34”
P123-25-4243	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (SB) - PLAN PROFILE STA. 4+160 TO 4+320	22” x 34”
P123-25-4244	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (SB) - PLAN PROFILE STA. 4+320 TO 4+470	22” x 34”
P123-25-4245	CONCORDIA INTERCHANGE RAMPS ENTRY RAMP (SB) - PLAN PROFILE STA. 4+470 TO 4+572.48	22” x 34”
P123-25-4246	CONCORDIA INTERCHANGE RAMS EXIT RAMP (NB) - PLAN PROFILE STA. 2+000 TO 2+160	22” x 34”
P123-25-4247	CONCORDIA INTERCHANGE RAMPS EXIT RAMP (NB) - PLAN PROFILE STA. 2+160 TO 2+290	22” x 34”
P123-25-4248	CONCORDIA INTERCHANGE RAMPS LEFT TURN SB-EXIT RAMP - PLAN PROFILE STA. 5+000 TO 5+115.16	22” x 34”
P123-25-4249	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+000 TO 0+130 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4250	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+130 TO 0+280 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4251	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+280 TO 0+415 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4252	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+415 TO 0+570 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4253	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+570 TO 0+710 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4254	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+710 TO 0+850 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4255	CONCORDIA AVENUE - PLAN-PROFILE STA. 0+850 TO 1+000 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4256	CONCORDIA AVENUE - PLAN-PROFILE STA. 1+000 TO 1+157 MOLSON ST TO PEGUIS ST	22” x 34”
P123-25-4257	MULTI-USE PATH - PLAN-PROFILE STA. 0+000 TO 0+130 REENDERS DR TO ALMEY AVE	22” x 34”
P123-25-4258	MULTI-USE PATH - PLAN-PROFILE STA. 0+130 TO 0+245 REENDERS DR TO ALMEY AVE	22” x 34”
P123-25-4259	MULTI-USE PATH - PLAN-PROFILE STA. 0+245 TO 0+360 REENDERS DR TO ALMEY AVE	22” x 34”
P123-25-4260	MULTI-USE PATH - PLAN-PROFILE STA. 0+525 TO 0+685 EL TASSI DR TO REVELSTONE AVE W	22” x 34”
P123-25-4261	MULTI-USE PATH - PLAN-PROFILE STA. 0+685 TO 0+840 EL TASSI DR TO REVELSTONE AVE W	22” x 34”
P123-25-4262	MULTI-USE PATH - PLAN-PROFILE STA. 0+840 TO 1+000 EL TASSI DR TO RAVELSTONE AVE W	22” x 34”
4.3 SECTIONS AND DETAILS		
P123-25-4301	CROSS SECTIONS (1 TO 3) LAGIMODIERE BOULEVARD	22” x 34”
P123-25-4302	CROSS SECTIONS (4 TO 5) LAGIMODIERE BOULEVARD	22” x 34”
P123-25-4303	CROSS SECTIONS (6 TO 7) LAGIMODIERE BOULEVARD	22” x 34”

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
P123-25-4304	CROSS SECTIONS (8 TO 10) LAGIMODIERE BOULEVARD	22" x 34"
P123-25-4305	CROSS SECTIONS (11 TO 12) LAGIMODIERE BOULEVARD	22" x 34"
P123-25-4306	CROSS SECTIONS (13 TO 18) CONCORDIA INTERCHANGE RAMPS	22" x 34"
P123-25-4307	CROSS SECTIONS (19 TO 21) CONCORDIA INTERCHANGE RAMPS	22" x 34"
P123-25-4308	CROSS SECTIONS (8 OF 10) CONCORDIA AVENUE	22" x 34"
P123-25-4309	CROSS SECTIONS (9 OF 10) CONCORDIA AVENUE	22" x 34"
P123-25-4310	CROSS SECTIONS (10 OF 10) MULTI-USE PATH	22" x 34"
P123-25-4311	GUARDRAIL DETAILS LAGIMODIERE BLVD NORTHBOUND SOUTH OF BRIDGE, LEFT SIDE	22" x 34"
P123-25-4312	GUARDRAIL DETAILS LAGIMODIERE BLVD NORTHBOUND SOUTH OF BRIDGE, RIGHT SIDE	22" x 34"
P123-25-4313	GUARDRAIL DETAILS LAGIMODIERE BLVD SOUTHBOUND NORTH OF BRIDGE, LEFT SIDE	22" x 34"
P123-25-4314	GUARDRAIL DETAILS LAGIMODIERE BLVD SOUTHBOUND NORTH OF BRIDGE, RIGHT SIDE	22" x 34"
P123-25-4315	GUARDRAIL DETAILS EXIT RAMP NORTHBOUND (1 OF 2) NORTH OF BRIDGE, RIGHT SIDE	22" x 34"
P123-25-4316	GUARDRAIL DETAILS EXIT RAMP NORTHBOUND (2 OF 2) NORTH OF BRIDGE, RIGHT SIDE	22" x 34"
P123-25-4317	GUARDRAIL DETAILS APPROACH GUARDRAIL	22" x 34"
P123-25-4318	GUARDRAIL DETAILS ET-31 - GUARDRAIL END TREATMENT	22" x 34"
P123-25-4319	ROAD DETAILS	22" x 34"
P123-25-4320	ON-GRADE DRAINAGE CHUTE DETAIL	22" x 34"
4.4 PATHWAY ELECTRICAL		
P123-25-4401	ACTIVE TRANSPORTATION - LAGIMODIERE BLVD. PATHWAY LIGHTING REENDERS DR. TO ALMEY AVE.	22" x 34"
P123-25-4402	ACTIVE TRANSPORTATION - LAGIMODIERE BLVD. PATHWAY LIGHTING EL TASSI DR. TO RAVELSTON AVE. W	22" x 34"
P123-25-4403	ACTIVE TRANSPORTATION - CONCORDIA AVE W PATHWAY LIGHTING MOLSON ST. TO LAGIMODIERE OVERPASS	22" x 34"
P123-25-4404	ACTIVE TRANSPORTATION - CONCORDIA AVE E PATHWAY LIGHTING LAGIMODIERE OVERPASS TO PEGUIS ST.	22" x 34"
P123-25-4405	ACTIVE TRANSPORTATION - LAGIMODIERE BLVD. CSTE "A" ELECTRICAL DETAILS	22" x 34"
P123-25-4406	ACTIVE TRANSPORTATION - LAGIMODIERE BLVD. CSTE "B" ELECTRICAL DETAILS	22" x 34"
P123-25-4407	ACTIVE TRANSPORTATION - LAGIMODIERE BLVD. CSTE "B" ELECTRICAL DETAILS	22" x 34"
P123-25-4408	ACTIVE TRANSPROTATION - PATHWAY LIGHTING U/G POWER CIRCUIT CONDUCTORS TRENCH DETAILS	22" x 34"
4.5 SLOPE STABILIZATION		
P123-25-4501	SLOPE STABILIZATION PLAN	22" x 34"
4.6 CPKC GATE		
P123-25-4601	CPCK ACCESS GATE DETAILS	22" x 34"

E2. SHOP DRAWINGS

E2.1 Description

E2.1.1 This Specification provides instructions for the preparation and submission of Shop Drawings.

E2.1.2 This Specification shall revise, amend, and supplement the requirements of CW 1110.

E2.1.3 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.

E2.1.4 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.

E2.1.5 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.

E2.1.6 Shop Drawings are required for the following components:

(a) Structural Removals;

(b) Temporary Protection System;

(c) Expansion Joints;

(d) Fibre-Reinforced Polymer (FRP) Girder Strengthening;

(e) Discrete Galvanic Protection System;

(f) Supply and Installation of Bridge Bearings;

(g) Temporary Jacking and Support of Superstructure;

(h) Overhead Sign Support Structures; and

(i) Sign Panels

E2.2 Scope of Work

E2.2.1 The Work under this Specification shall include review of Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

E2.2.2 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.

E2.2.3 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.

E2.2.4 Notify Contract Administrator, in writing at time of shop drawing submission, of deviations from requirements of Contract Documents.

E2.2.5 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.

E2.2.6 Responsibility for errors and omissions in the shop drawing submission is not relieved by the Contract Administrator's review of the submittals.

E2.2.7 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.

E2.2.8 After the Contract Administrator has reviewed and returned the copies, distribute the copies to sub-trades as appropriate.

E2.2.9 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.

E2.3 Submittals

E2.3.1 The Contractor shall schedule submittals at least ten (10) Business Days prior to when reviewed submittals will be needed, and allow for a ten (10) Business Day period for review by the Contract Administrator or each individual submission and re-submission, unless otherwise noted in the Contract.

E2.3.2 Submit one (1) electronic PDF of Shop Drawings.

E2.3.3 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.

E2.3.4 Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

E2.3.5 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions, and review of Shop Drawings.

E2.3.6 Only two (2) reviews of Shop Drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator's scheduled rates and at the discretion of the Contract Administrator. The Contract Administrator’s charges for the additional Work will be deducted from the Contractor’s Progress Certificates.

E2.3.7 Accompany shop drawing submissions with a transmittal letter containing:

(a) Date;

(b) project title and bid opportunity number;

(c) Contractor’s name and address;

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

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

(f) drawing number and detail/section number;

(g) other pertinent data.

E2.3.8 Shop drawing submissions shall include:

(a) date and revision dates;

(b) project title and bid opportunity number;

(c) name of:

(i) Contractor;

(ii) Subcontractor;

(iii) supplier;

(iv) manufacturer;

(v) separate detailer when pertinent.

(d) identification of product or material;

(e) relation to adjacent structure or materials;

(f) field dimensions, clearly identified as such;

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

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

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

E2.3.9 Shop Drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:

(a) Temporary Protection System;

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

(c) Metal Fabrications, Layout, and Erection Details for Overhead Sign Support Structures;

(d) Metal Fabrication, Layout and Erection Details for Expansion Joints;

E2.4 Equipment

E2.4.1 General

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

E2.5 Measurement and Payment

E2.5.1 Shop Drawings will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E2.5.2 Material and equipment delivered to the Site will not be paid for until pertinent Shop Drawings have been submitted and reviewed.

E2.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

E3. MOBILIZATION AND DEMOBILIZATION PAYMENT

E3.1 Description

E3.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site as specified herein.

E3.1.2 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.

E3.1.3 The inclusion of a payment item for the Work under this Specification shall not release or reduce the responsibilities of the Contractor under any other specification in this Contract.

E3.2 References

E3.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision.

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

(b) CW 1130 – Site Requirements;

(c) Specification E7, Office Facilities;

(d) Specification E8, Traffic Control;

(e) Specification E9, Traffic Management;

(f) Specification E41, Rail

E3.3 Scope of Work

E3.3.1 The Work under this Specification shall include but not be limited to:

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

(b) Supplying, setting up, layout out, and removing site office facilities as detailed in Office Facilities (E7).

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

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

(e) Traffic Control (E8), and Traffic Management (E9);

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

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

(h) Other related job items.

E3.4 Submittals

E3.4.1 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.

E3.5 Materials

E3.5.1 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.

E3.6 Equipment

E3.6.1 General

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

E3.7 Construction Methods

E3.7.1 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.

E3.7.2 Site Security

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

E3.7.3 Access Roadway

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

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

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

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

E3.7.4 Restoration of Existing Facilities

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

E3.8 Quality Control and Assurance

E3.8.1 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.

E3.8.2 Access

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

E3.9 Measurement and Payment

E3.9.1 Mobilization and Demobilization

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

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

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

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

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

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

E3.9.2 Pay Reduction for Accessibility Plan

(a) The Demobilization payment will be reduced by the number of pay adjustments incurred in accordance with D18 and as determined by the Contract Administrator.

E4. GEOTECHNICAL REPORT

E4.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the existing soil conditions. The geotechnical report is contained in Appendix 'A'.

E5. PAVEMENT CORE REPORT

E5.1 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 Pavement Core Report is contained in Appendix 'B'.

E6. AT PATHWAY GEOTECHNICAL REPORT

E6.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the existing soil conditions of the AT pathways. The AT Pathway Geotechnical Report is contained in Appendix 'C'.

E7. OFFICE FACILITIES

E7.1 The Contractor shall supply office facilities meeting the following requirements:

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

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

(c) The building shall have a minimum floor area of 80 square metres, a height of 2.4 meters. Each building shall have two (2) windows for cross ventilation and a door entrance with a suitable lock.

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

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

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

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

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

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

E7.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E7.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance is completed.

E7.4 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.

E7.5 Measurement and Payment

E7.5.1 Office Facilities will be considered incidental to Mobilization and Demobilization. No separate measurement or payment shall be made for the work associated with this Specification.

E8. TRAFFIC CONTROL

E8.1 Further to 3.6, 3.7 and 3.8 of CW 1130:

(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 E48 Asphalt Pavement.

(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 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 placement of temporary traffic control devices by their own forces or Subcontractor.

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

(i) Parking restrictions;
(ii) Stopping restrictions;
(iii) Turn restrictions;
(iv) Full or directional closures on a Regional Street;
(v) Traffic routed across a median;
(vi) 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.

E8.2 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

E8.3 Further to E8.1(c) and E8.1(d) the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the Contract Work is complete. The Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.

E8.4 Any changes to the approved Traffic Management Plan must be submitted to the Contract Administrator a minimum of five (15) Working Days prior to the required change for approval.

E8.5 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. In this event the Contractor shall bear costs charged to the project by the Traffic Services Branch of the City of Winnipeg in connection with the required Works.

E8.6 The Contractor shall notify the Contract Administrator at least three weeks in advance to any scheduled ramp closure.

E9. TRAFFIC MANAGEMENT

E9.1 Further to 3.7 of CW 1130:

(a) An approved traffic staging/ signage plan is included in the Drawings and shall be followed accordingly. Any changes to this plan with respect to lane closures must be approved by the Contract Administrator.

E9.1.1 Additional sub-stages will need to be developed by the Contractor to accommodate pavement renewal and other Works throughout the Site including but not limited to the removal of all temporary works. The Traffic Management Plans must be submitted to the Contract Administrator a minimum of three weeks in advance total; that's one week for Contract Administrator review and two weeks for approval by Traffic Management. All Traffic Management Plans submitted for review shall be produced and sealed by a professional engineer registered in the province of Manitoba that has expertise in the design of Traffic Management Plans in the City of Winnipeg. Sample Traffic Management Plans are available upon request. The Contract Administrator will provide the Contract Drawings in digital (".dwg" filetype) format for the Contractor's use in developing Traffic Management Plans. The drawings produced by a professional engineer shall be developed using computer-aided design software application such as AutoCAD, to scale, and georeferenced complete with aerial imagery.

(b) The exit and entrance ramps shall be closed to traffic during the ramp pavement renewal as outlined on the traffic management plans. The Contractor will be responsible for the supply and installation of signage relating to the closure of these ramps. A route detour will be implemented at that time and City of Winnipeg Traffic Management will coordinate the supply and installation of signs relating to these route detours.

(c) The intersection of Grassie Boulevard and Lagimodiere Blvd and Lagimodiere Blvd. 200 m south of the intersection (both directions) shall remain open to traffic until commencement of construction within this specific area. No lane closures are to occur prior to construction of this area.

(d) At the Lagimodiere Blvd/Grassie Road intersections the Contractor shall maintain the following traffic lanes:

(i) Lagimodiere Blvd NB and SB – 1 through lane, 1 left turn lane and 1 right turn lane shall be maintained and kept open at a minimum.

(ii) Grassie Blvd EB and WB – 1 through lane, 1 left turn lane and 1 right turn lane shall be maintained and kept open at a minimum.

(e) The intersection of Almey Avenue and Lagimodiere Blvd and Lagimodiere Blvd. 100 m north of the intersection (both directions) shall remain open to traffic until commencement of construction within this specific area. No lane closures are to occur prior to construction of this area.

(f) Maintain a minimum of one lane of traffic on Lagimodiere Blvd northbound and southbound for the duration of the project including during paving and milling operations.

(g) For the removal of the temporary works (crossover detours, etc.) and the completion of any proposed works (permanent median works located in conflict with the crossover detours, for example) that cannot be achieved during Stage 1 and Stage 2 (as detailed within the Traffic Management Plans), the Contractor shall submit a customized traffic management plan for approval and maintain the following traffic operations on Lagimodiere Boulevard and Concordia Avenue throughout those works:

(i) Concordia Avenue

(i) Maintain a minimum of one lane of traffic westbound and one lane of traffic eastbound on Concordia Avenue during work. When no work is being performed on site, lane closures will not be permitted.

(ii) No lane closures of eastbound traffic will be permitted on Concordia Avenue, without the written permission of the Contract Administrator, however traffic can be shifted onto the shoulder once should improvements have been completed;

(ii) Lagimodiere Boulevard

(i) Maintain a minimum of two southbound traffic lanes and two northbound traffic lanes on Lagimodiere Boulevard during the morning peak period (07:00 – 09:00) and the afternoon peak period (15:00 – 18:00).

(ii) Lane closures on Lagimodiere Boulevard will require Designated Construction Zone and zipper merge signage.

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

(i) 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

(j) Pedestrian access must be maintained on the north side of Concordia Avenue to allow east-west pedestrian traffic underneath the Lagimodiere Twin Overpasses at all times.

(k) Where left turn lanes exist, an additional lane to accommodate the left turn storage lane shall be maintained at all times.

(l) The northbound right-turn lane at Grassie Boulevard shall remain open at all times during the closure of the eastbound ramps. The Contractor shall ensure that these two closures do not occur simultaneously to maintain traffic flow and detour efficiency.

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

(n) Winnipeg Transit access to be maintained, including bus stops. Should the Contractor be unable to maintain bus stops or side street bus routes, it shall be reviewed with the Contract Administrator at least forty-eight (48) hours prior to impact to Transit to see if modifications can be made.

(o) The Contractor shall advise the Contract Administrator five (15) Working Days in advance of any new or change in lane closure.

(p) 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, and/or the Contract Administrator.

(q) 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 his/her operations in no way interfere with the safe operation of traffic, cyclists or pedestrians.

(r) Improper signing will be sufficient reason for the Contract Administrator to order the Works to cease on Site.

(s) 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.

E9.2 Traffic Management will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E10. PEDESTRIAN SAFETY

E10.1 Description

E10.1.1 This Specification shall cover all operations relating to pedestrian safety within and surrounding the project limits, as determined by the Contract Administrator.

E10.1.2 During the project, a temporary snow fence shall be installed at locations as deemed by the Contract Administrator . The Contractor shall be responsible for maintaining the snow fence in a proper working condition. No measurement for payment shall be made for this work.

E10.1.3 The Contractor shall provide a covered walkway to maintain pedestrian access along the existing sidewalk on the north side of Concordia at all times.

E10.1.4 The Contractor shall be solely responsible for the design, construction, and maintenance of any pedestrian protection systems.

E10.2 Submittals

(a) The covered walkway system shall be designed by, prepared by, and bear the seal and signature of a Professional Engineer (Design Engineer) registered in the Province of Manitoba. Detailed drawings, specifications and design notes for the covered walkway, bearing the seal and signature of the Design Engineer shall be submitted by the Contractor to the Contract Administrator at least seven (7) calendar days prior to the start of any protection system installation in accordance with Specification 0 “

4.6 CPKC GATE		
P123-25-4601	CPCK ACCESS GATE DETAILS	22” x 34”

(b) Shop Drawings”. The submission of the protection covered detailed drawings, specifications and design notes to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the design and safe and effective functioning of the covered walkway.

(c) The Contractor shall provide the Contract Administrator with proof that the covered walkway is installed in accordance with the detailed drawings and specifications. This proof shall be in the form of a letter bearing the seal and signature of covered walkway’s Design Engineer certifying that the covered walkway Design Engineer has carried out a personal inspection of the installation, and that the installation is in accordance with the design.

E10.3 Materials

E10.3.1 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.

E10.3.2 Equipment

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

E10.4 Construction Methods

E10.4.1 Covered Walkway

(a) The Contractor shall maintain pedestrian access along the existing sidewalk on the north side of Concordia.

(b) A covered walkway shall be used to protect pedestrians from all construction activities potentially impacting the sidewalk, including overhead work.

(c) The design and implementation of the covered walkway shall include additional safety measures, including but not limited to lighting, signage, fencing and barriers, to safely direct pedestrians through the covered walkway and to prevent pedestrians from accessing the construction site in potentially hazardous areas.

(i) The Contractor shall perform weekly reviews of the operation and condition of the covered walkway with the Contract Administrator. The Contractor shall make any changes deemed necessary by the Contract Administrator to maintain or improve pedestrian safety within and adjacent to the Site. The Contractor shall immediately notify the Contract Administrator of any safety

issues with pedestrians and shall work with the Contract Administrator to rectify potential safety concerns.

(d) The covered walkway shall:

(i) Comply with the 2010 National Building Code of Canada and the 2016 Manitoba Workplace Safety and Health Act and Regulation (Sections 20.2 to 20.4);

(ii) Have a clear width of 1.830 m and a clear heigh of not less than 2.5 m;

(iii) Have a continuous, solid, slip-resistance walking surface with a wayfinding curb at ground level;

(iv) Be equipped with working lights and shall have well-lit entrances;

E10.5 Measurement and Payment

(a) Pedestrian Safety will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E11. WATER OBTAINED FROM THE CITY

E11.1 Further to 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 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.

STRUCTURAL WORKS

E13. TEMPORARY PROTECTION SYSTEM

DESCRIPTION

E13.1 General

(a) This Specification shall cover all operations related to the design, supply, installation, maintenance and removal of temporary protective systems.

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

E13.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Section D19, Environmental Protection Plan

(ii) Section E10, Pedestrian Safety

(iii) Specification E15, Structural Removals

(iv) Specification E23, Structural Concrete

(v) Specification E27, Temporary Jacking and Support of Superstructure

(vi) Specification E30, Fibre-Reinforced Polymer (FRP) Strengthening

(vii) Specification E41, Rail

E13.3 Scope of Work

E13.3.1 The Work under this Specification shall involve:

(a) Demolition Catch Platforms and Work Platforms;

(b) Temporary protective systems shall also be intended to permit the Contractor to carry out the following works:

(i) Demolition of existing bridge deck and barriers;

(ii) FRP strengthening of concrete girders;

(iii) Removal and installation of bearings and repairs and modifications to piers and abutments.

(iv) Construction of new bridge deck;

(v) Any other activities required to complete the Works.

E13.4 Submittals

(a) The protective systems shall be designed by, prepared by, and bear the seal and signature of a Professional Engineer (Design Engineer) registered in the Province of Manitoba. Detailed drawings, specifications and design notes for the protective systems, bearing the seal and signature of the Design Engineer shall be submitted by the Contractor to the Contract Administrator at least seven (7) calendar days prior to the start of any protection system installation in accordance with Specification 0 “

4.6 CPKC GATE		
P123-25-4601	CPCK ACCESS GATE DETAILS	22” x 34”

(b) Shop Drawings”. The submission of the protection system detailed drawings, specifications and design notes to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the design and safe and effective functioning of the protective system.

(c) The Contractor shall provide the Contract Administrator with proof that the protective systems are installed in accordance with the detailed drawings and specifications. This proof shall be in the form of a letter bearing the seal and signature of protective systems’ Design Engineer certifying that the protective system Design Engineer has carried out a personal inspection of the installation, and that the installation is in accordance with the design.

MATERIALS

E13.5 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.

EQUIPMENT

E13.6 General

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

CONSTRUCTION METHODS

E13.7 General

(a) The Contractor shall be responsible for constructing the temporary protective systems.

(b) The Contractor shall be fully responsible for ensuring the public safety in areas underlying and adjacent to the construction site. The Contractor will be responsible for any loss or damage caused as a result of the Contractor's actions. Any debris that enters the roadway envelope of a travelled lane shall be immediately cleaned up by the Contractor.

(c) It can be suspended from the existing superstructure, supported from the existing ground, or otherwise. Any stay-in-place anchorages that are installed shall be stainless steel and shall be set back a minimum of 12 mm from the exposed surface and subsequently grouted with a high quality grout per E23.26. The details of any proposed anchorages or attachments to the existing structure shall be included in the submitted drawings of the temporary protective system, and subject to the approval of the Contract Administrator.

E13.8 Temporary Protective Systems

(a) The Contractor shall provide all necessary access / work platforms to facilitate structural removals and associated inspection of all Works by the Contract Administrator.

(b) The platforms shall be designed by the Contractor's Engineer to support the anticipated construction live load as well as any anticipated dead load resulting from fallen removal / demolition debris.

(c) The platforms shall be designed to be of a type that does not detrimentally affect the structural integrity of the existing bridge structure. Drilling into the girders to secure any platforms shall not be permitted.

(d) The Contractor shall construct temporary protective systems to prevent debris, tools, forms, waste products, construction materials and equipment, and any material whatsoever from falling onto roadway envelope, sidewalk, or CPKC ROW. The Contractor shall take all necessary safety precautions to ensure that no materials leave the construction work areas and subsequently enter the roadway envelope or CPKC ROW during the Contractor's construction operations. The roadway envelope of any travelled lane is defined as follows:

(i) Horizontally, it is the space occupied from hypothetical lane edge to lane edge.

(ii) Vertically, the existing vertical clearances shall be maintained at all times.

(e) The systems shall include but not necessarily be limited to platforms beneath the deck, extending beyond the proposed edge of new deck along both exterior edges of the bridge and other catch platforms beneath the bridge superstructure and abutting the piers, as required for construction purposes, and to collect and contain products of demolition, and all other debris, and prevent them from falling onto underlying surfaces.

(f) The protective systems shall be designed and constructed as required to catch and retain all products of demolition. Collection and containment information and details associated with the demolition catch platform shall form part and parcel of the plan detailed in E15, Structural Removals.

(g) The Contractor is advised that construction work including but not limited to: dismantling, general demolition and removals, surface preparation, bearing installation, reinforcing bar installation, concrete forming, concrete pouring, and related construction works will be occurring in close proximity to the travelling public and over Concordia Avenue, and associated active transportation and pedestrian paths.

QUALITY CONTROL AND ASSURANCE

E13.9 Quality Control

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

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

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E13.10 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.

MEASUREMENT AND PAYMENT

E13.11 Design, supply, installation, maintenance and removal of temporary protective systems will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Temporary Protective Systems", which price shall be payment in full for supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E14. ENVIRONMENTAL CONTAINMENT COLLECTION AND DISPOSAL

DESCRIPTION

E14.1 General

(a) This Specification shall cover environmental protection and capture systems during construction, including the necessary enclosure system(s) as specified herein.

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

E14.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Section D19, Environmental Protection Plan
(ii) Section D20, Environmental Protection Plan – Migratory Birds
(iii) Specification E15, Structural Removals
(iv) Specification E23, Structural Concrete
(v) Specification E30, Fibre-Reinforced Polymer (FRP) Strengthening

E14.3 Scope of Work

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

(i) It is intended that this Specification cover the following Works associated with environmental protection:

(ii) Containment, collection and disposal of debris generated by concrete demolition Works as well as reinforcing steel and concrete surface preparation Works (non-hazardous waste unless contaminated with spent sandblasting abrasive).

(iii) Containment, collection and disposal of debris generated by girder FRP strengthening, painting, and associated Works.

E14.4 Submittals

(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.

(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 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.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least 14 working days prior to the scheduled commencement of erection, design drawings sealed by a Professional Engineer registered in the Province of Manitoba detailing the Contractor's proposed containment hoarding system. The details will not be accepted if not sealed by the Professional Engineer. The submission of such details to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the containment hoarding system. The containment hoarding shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health requirements. No Work shall commence before the Contract Administrator has completed the review and advised the Contractor. As part of his responsibilities, the design Engineer whose seal is on the documents will be required to inspect the containment hoarding on site to ensure conformity with the design. The design Engineer will certify this conformity in writing and submit this certification to the Contract Administrator.

MATERIALS

E14.5 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 approval by the Contract Administrator.

EQUIPMENT

E14.6 General

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

CONSTRUCTION METHODS

E14.7 General

(a) In general the Contractor shall ensure that the debris from concrete demolition Works, surface preparation of reinforcing steel and concrete surfaces and the girder FRP strengthening and painting will not result in harmful effects or nuisance to land, buildings, vehicles, and pedestrians in the vicinity of the Contract area.

(b) The Contractor shall conduct his operations in accordance with all current Federal, Provincial or other regulations with respect to environmental protection and pollution control. It shall be the Contractor's responsibility to be familiar with all applicable environmental regulations, to obtain all necessary approvals and permits for his operations and to ensure that all applicable environmental requirements are met and adhered to.

E14.8 Allowable Construction Loads

(a) The loading from all equipment, platforms, materials, work persons, etc. shall be restricted so that the total forces from these loadings in the concrete superstructure and work platform are less than or equal to the total forces from the allowable forces.

(b) Non-Hazardous Waste

(i) The Contractor is advised of the general concern regarding contamination of land areas and waterways by the debris generated from concrete and wood removal Works and water from pressure washing of girders. The Contractor shall take precautions necessary to ensure that such contamination does not take place.

(ii) The Contractor shall take necessary precautions to ensure that bridge materials do not fall onto the ground or into the water areas below during concrete and wood removal Works. The Contractor shall provide, erect and maintain platforms, hoarding and other structures as required to catch and retain all concrete and wood waste materials.

(iii) Any debris that falls off the bridge shall be immediately cleaned up by the Contractor at his own expense.

(iv) All waste material generated from the concrete and wood removal Works shall become the property of the Contractor. The Contractor shall promptly remove all debris generated by these Works off and away from the site. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

QUALITY CONTROL AND ASSURANCE

E14.9 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 approval that may have been previously given. The Contract Administrator reserves the right to reject 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.

E14.10 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.

MEASUREMENT AND PAYMENT

E14.11 General

(a) Environmental containment, collection and disposal as defined in this Specification will not be measured. This Item of Work will be paid for at the Contract Lump Sum price for

"Environmental Containment, Collection and Disposal", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(b) The Contractor shall provide and pay for monitoring within the enclosure to suit the requirements at Workplace Health and Safety. Any waste stream that is not contained, collected, and disposed of shall be cleaned up immediately by the Contractor at their own cost.

E15. STRUCTURAL REMOVALS

DESCRIPTION

E15.1 General

(a) This Specification shall cover all operations relating to:

(i) The removal and disposal of existing bridge components and concrete, as specified herein and as shown on the Drawings.

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

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

E15.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Section D19, Environmental Protection Plan

(ii) Specification E8, Traffic Control;

(iii) Specification E9, Traffic Management;

(iv) Specification E10, Pedestrian Safety;

(v) Specification E41, Rail

(vi) City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers;

(vii) ICRI Guideline No. 03732.

(b) Details of the Existing Structure

(i) 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.

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

E15.3 Scope of Work

E15.3.1 The Work under this Specification shall specifically include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

E15.3.2 Bridge Demolition

(a) Concrete Removals as follows:

(i) Complete removal and disposal of the existing bridge deck with thin epoxy overlay. Reinforcing from existing girders into concrete deck are to be salvaged as noted on the Plans;

(ii) Complete removal and disposal of all concrete bridge traffic barriers;

(iii) Complete removal and disposal of concrete approach slabs;

(iv) Complete removal and disposal of concrete slope protection on south embankment;

(v) Partial removal and disposal of abutment ballast walls and wingwalls;

(vi) Partial removal and disposal of existing bridge wingwalls, including integral traffic barriers;

(vii) Removal and disposal of concrete girder diaphragms at all bearing locations;

(viii) Partial demolition of intermediate concrete diaphragms as shown on the Drawings.

(ix) Concrete removal shall include removal of reinforcing steel as shown on the Drawings.

(b) Steel Removals as follows:

(i) Complete removal and disposal of existing bridge expansion joints assemblies and cover plates;

(ii) Complete removal and disposal of existing underbridge conduit hangers and supports;

(iii) Complete removal and disposal of existing bridge bearing assemblies;

(c) Electrical Removals as follows:

(i) Removal and disposal of all conduits, cables, underbridge light assemblies and device boxes on the bridge piers and abutments.

(ii) The Contractor shall note that the existing conduits mounted to the underside of the northbound structure contain asbestos. All required safety requirements for removals, handling, and disposal shall be considered incidental to this work.

(d) Miscellaneous Removals as follows:

(i) Removal and disposal of existing abutment subdrains within abutment wingwalls. Subdrain extensions outside abutment concrete limits shall be abandoned.

(ii) Removal and disposal of existing south embankment concrete slope protection subdrain.

(e) Salvage Items as follows:

(i) Removal and salvaging of existing aluminum barrier rail and posts installed on existing bridge concrete barriers.

(ii) Removal and salvage of existing approach bridge guardrail;

(iii) All existing reinforcing not noted for removal shall be salvaged, including existing reinforcing from concrete girders into the concrete deck. Any damage to existing reinforcing shall be corrected at the Contractor’s expense.

(f) Completing all structural removals with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way onto the sidewalk or roadway lanes which shall remain open to traffic.

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

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

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

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

E15.3.3 Hazardous Materials

(a) As described in Section E15.3.2(c), the underbridge conduits on the northbound structure contain asbestos.

E15.4 Submittals

E15.4.1 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 removal Works on Site, a detailed removal plan and schedule clearly illustrating the method and sequence by which the Contractor proposes to perform the structural removals including a description of the measures that will be implemented to meet the applicable environmental requirements identified in “PART D - Supplemental Conditions”. The removal procedure shall include Detailed Design notes and Shop Drawings that are sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba necessary for the following proposed items:

(i) Work platforms (suspended from the existing superstructure, supported from the existing ground, or otherwise);

(ii) Type and capacity of removal equipment;

(iii) Sequence of removal operations;

(iv) Fencing plan to prevent public access until all railings are reconstructed.

(v) Description of the measures that will be implemented to meet the requirements identified in “PART D - Supplemental Conditions”.

E15.4.2 Hazardous Materials

(a) The Contractor shall develop and submit an Asbestos Control Plan for the safe removal and disposal of the existing underbridge conduits containing asbestos. The submittal shall outline the Contractors plan for the safe removal and disposal of hazardous materials and compliance with the necessary regulations and guidelines including, but not limited to, the following:

(i) SAFE Work Manitoba guidance document entitled Guide for Asbestos Management (November 2020);

(ii) Manitoba The Dangerous Goods Handling and Transportation Act;

(iii) Manitoba Environment and Climate Change’s guideline Managing Demolition Debris Containing Hazardous Materials (June 2020, revised October 2021)

(iv) Manitoba Workplace Safety and Health Regulations

E15.4.3 The Contractor shall prepare and submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any hydro-demolition Work on Site, a hydro-demolition plan detailing the Contractor’s proposed hydro-demolition runoff control and disposal methods and procedures.

(a) Wastewater from the hydro-demolition process shall meet the requirements of the City of Winnipeg By-Law No. 7070/97 Part 5, Control of Discharge to Sewers, prior to entering the City’s land drainage sewer system.

(b) At no time can runoff of wastewater be permitted to enter the watercourse or the City’s land drainage system unfiltered.

MATERIALS

E15.5 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.

E15.6 Demolition Catch Platforms and Work Platforms

(a) Shall be in accordance with Specification E13 Temporary Protection System.

E15.7 Environmental Containment and Disposal

(a) Shall be in accordance with Specification E14 Environmental Containment Collection and Disposal

EQUIPMENT

E15.8 General

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

(b) The use of explosives is prohibited.

E15.9 Demolition Barriers

(a) The Contractor shall provide all necessary temporary barriers and fencing to protect the general public from the products of the demolition process. The barriers shall not impede the concrete removals process or associated inspection of all Works by the Contract Administrator.

E15.10 Sequence Of Structural Removals

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

CONSTRUCTION METHODS

E15.11 General

(a) Structural removals shall be deemed to include all the items of work as listed under Clause E15.3 of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.

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

(c) The Contractor shall provide flagmen, guards, barricades, railings, fencing and necessary warning lights, and whenever/wherever necessary, warning signs and lights at the excavations, 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 the Canada Labour Code.

(d) Traffic and pedestrian control shall conform to the requirements of Specification E8 “Traffic Control”, Specification E9 “Traffic Management”, Specification E10 “Pedestrian Safety”;

(e) Under no circumstances shall the Contractor close any portion of existing roadways or walkways to traffic without prior written approval of the Contract Administrator. If any existing roadway is to be closed to traffic in no case shall the Contractor commence any construction operations until such time that all the signs, barricades, and flashers have been erected to the satisfaction of the Contract Administrator.

(f) The Contractor shall generally prevent any unspecified and undesirable movement or settlement of the existing structure, damage to any existing structures to remain, and damage to any services, paving, trees, landscaping and adjacent grades not specified for removal/disturbance. The Contractor shall design and provide any bracing, shoring or underpinning necessary to complete the work as required and shall have any designs for this Work sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba. If the safety of the structure and/or existing services appears to be endangered during structural removal operations or if the Work is detrimentally impacting

the environment, the Contractor shall cease operations and notify the Contract Administrator immediately. Additionally, if the Work is proceeding in a fashion unsatisfactory to the Contract Administrator for any reason, the Contractor will be notified and shall cease operations immediately.

(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 components or to any new construction. In the event that any component is damaged, the Contractor shall repair such component at his own expense to the satisfaction of the Contract Administrator.

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

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

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

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

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

(m) 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.

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

E15.12 Concrete Removals

(a) No removal works including the full-depth superstructure isolation will be permitted to occur prior to the implementation of the necessary traffic control requirements in accordance with Specification E8 "Traffic Control".

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

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

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

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

(d) For partial removal of concrete, edges shall be sawcut to straight and clean lines.

(e) Removals may be accomplished by full-depth saw cuts where possible provided any existing reinforcement required to be maintained is not damaged in the process. Subsequent removal around existing reinforcement specified to be maintained will be required with the use of hand removal, hydro-demolition, or other means acceptable to the Contract Administrator.

(f) See Specification E16 "Structural Excavation" for specifications for excavating behind and in front of the abutments to expose the abutment backwall and front wall and other components for removal.

(g) The final surface preparation of the concrete to remain (concrete substrate) shall be conducted by abrasive blasting, hydro-demolition, or other means acceptable to the Contract Administrator. The resulting surface shall achieve the required elevations while being roughened to the minimum following requirements:

(i) For horizontal surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP6 (Medium Scarification).

(ii) For vertical surfaces, concrete shall be removed, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP4 (Light Scarification).

(iii) For girder ends and attachment to proposed abutment and pier end diaphragms, concrete shall be removed, roughened, and prepared in accordance with ICR Guideline No. 03732, CSP6 (Medium Scarification) to an amplitude of 6mm.

E15.13 Steel Removals

(a) Upon jacking and shoring of the superstructure as per E27 Temporary Jacking of Superstructure, the Contractor shall remove and dispose of the existing bridge bearings. Any existing bearing anchors shall be removed or cut to a final depth of 25 mm inside the final concrete surface. Patches for cut anchors shall be filled with Sikadur®-31 Hi-Mod Gel, or equivalent approved in accordance with B6 “Substitutes”.

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

E15.14 Salvage Items

(a) Existing aluminum barrier rail and posts installed on existing bridge concrete barriers shall be removed and salvaged in accordance with the Specification CW 3650-R6. All salvaged materials deemed reusable shall be delivered to the City of Winnipeg Bridge Yard, attention Mike Terleski, unless otherwise directed by the Contract Administrator.

(b) Existing approach guardrail be salvaged in accordance with the Specification E52, “Salvaged Guardrail”.

(c) The Contractor is responsible for removing all salvage items and stockpile at a location within the City of Winnipeg indicated by the Contract Administrator. The Contractor shall only use methods of removal that will not damage the salvaged items.

E15.15 Waste Handling and Disposal of Removed Materials

(a) Dispose of all surplus and unsuitable material off-site, in accordance with Section D19, “Environmental Protection Plan”.

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

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

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

E15.16 Removal of Hazardous Materials

(a) The Contractor shall be responsible for confirming the presence of asbestos in the existing underbridge conduits. If the presence of asbestos is confirmed, the Contractor shall be responsible for the safe removal and disposal of all hazardous materials from the site.

(b) All asbestos containing materials and all other hazardous materials cleared from the site shall become property of the contractor and shall be transported off-site to an approved disposal facility or location. No on-site burning or burying of any cleared material shall be permitted.

(c) The Contractor shall be responsible for all environmental, health and safety precautions necessary in all activities, including but not limited to handling, containment, temporary

storage, transportation and disposal of hazardous materials. The Contractor shall follow Manitoba Environment and Climate Change's Guideline for Managing Demolition Debris Containing Hazardous Materials available at http://www.manitoba.mb.ca/sd/pubs/waste_management/hazardous/managing_demolition_debris.pdf.

(d) In addition, the Contractor shall be responsible for all necessary permits, other requirements, and all associated costs for the removal and disposal of these hazardous materials under all acts and regulations, be it municipal, provincial, and/or federal.

(e) Where hazardous materials are abated, develop and submit a HAZMAT Abatement Report. This document and the abatement work shall be completed by a qualified professional. This document shall be submitted to the Engineer prior to commencing any demolition work and shall be in accordance with the Manitoba Workplace Safety and Health Regulation and SAFE Work Manitoba's Guide for Asbestos Management.

E15.17 Bridge Deck Survey

(a) The Contractor shall complete a survey of four (4) existing girder spans soffits, two (2) existing interior and two existing exterior (2) girder spans, at uniformly spaced locations not greater than 1/10 the span length prior to removal and immediately following removal of the existing bridge deck, or as directed by the Contract Administrator.

(b) The Contractor shall complete a survey on the centerline of all existing concrete girder top flanges at uniformly spaced locations not greater than 1/10 the span length following removal of the existing concrete deck and complete erection of all deck formwork. The elevations shall be submitted to the Contract Administrator for determination of the bridge deck haunch heights.

(c) The Contractor shall complete a survey of the final concrete bridge deck at the same locations as used in E15.17(b) after completion of all removals and final preparation of the deck surface prior to placement of new asphalt wearing surface and waterproofing membrane. The elevations shall be submitted to the Contract Administrator for review to determine the profile of the asphalt wearing surface.

(d) The Contract Administrator shall use the results of the final survey to provide the final screed elevations for the new deck slab concrete. The final screed elevations shall be provided within five (5) Business Days from receipt of the survey elevations.

QUALITY CONTROL AND ASSURANCE

E15.18 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.

E15.19 Access

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

MEASUREMENT AND PAYMENT

E15.20 Structural Removals

(a) Structural removals will not be measured. Structural Removals will be paid for at the Contract Lump Sum Prices for the “Items of Work” listed here below, which price shall be payment in full for supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(b) Items of Work:

Structural Removals

(i) Bridge Demolition

(ii) Salvaging Existing Barrier Rail

(iii) Hazardous Materials

E16. STRUCTURAL EXCAVATION

DESCRIPTION

E16.1 General

(a) This Specification covers all operations relating to the following:

(i) Excavation required to construct the Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related Works.

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

E16.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) CW 3110 – R22 – Subgrade, Sub-Base, and Base Course Construction;

(ii) CW 3170 – R3 – Earthwork and Grading; and

E16.3 Scope of Work

(a) The Works under this specification shall include the following items, which are incidental to the Work.

(i) Excavation works.

(ii) Preparation of the base of excavations.

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

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

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

SUBMITTALS

E16.4 The Contractor shall submit to the Contract Administrator for review and approval, at least 14 Calendar Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E16.5 The Contractor shall submit to the Contract Administrator for review and approval, at least 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 0.

(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.

MATERIALS

E16.6 Protection

(a) 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) MTS line extending from the northbound structure to the north and south of the bridge and along Kingston Row.

(ii) CPKC infrastructure at base of south embankment concrete slope protection. Refer to Specification E41 “Rail”.

(iii) Existing buried fibre optic cable within CPKC ROW at the base of the south embankment.

E16.7 Excavation

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

(b) 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.

(c) 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.

EQUIPMENT

E16.8 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E16.9 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.

(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.

QUALITY CONTROL AND ASSURANCE

E16.10 Quality Control

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

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

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E16.11 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.

MEASUREMENT AND PAYMENT

E16.12 Structural Excavation

(a) The excavation required for the Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related Works will not be measured. Structural Excavation will be paid for at the Contract Lump Sum Price for “Structural 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.

E17. ABUTMENT SUBSURFACE DRAINAGE

DESCRIPTION

E17.1 General

(a) This Specification covers all operations relating to the supply and installation of the subdrain pipe and drain systems located behind the abutment backwall and both sides of abutment back wall including leads, trenches and connections to the wick drain and termination at the base of the roadway embankment at all abutments as shown on the Drawings.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of the 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

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Standard Construction Specification CW 2130 – R12

(ii) Standard Construction Specification CW 3120 – R4

(iii) Standard Construction Specification CW 3615 – R4

E17.3 Scope of Work

(a) The Work under this Specification shall include the following items, which are incidental to the Work:

(i) Installation of perforated subdrain as indicated on the Drawings, including drainage material and drainage fabric.

(ii) Placement and compaction of granular bed.

(iii) Supply, placement and connection of drainage pipes.

(iv) Supply, placement and connection of wick drain pipes to footing subdrain.

(v) Extension of drain outlet pipes to base of embankments as shown on the Drawings.

(vi) Supply and placement of random stone riprap

E17.4 Submittals

(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.

(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 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.

MATERIALS

E17.5 General

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

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

E17.6 Drain Pipes, Fittings, and Accessories

(a) Drain pipes, fittings and other accessories and appurtenances for substructure drain pipe systems shall be 150 mm diameter, Schedule 40 PVC, with holes 12 mm in diameter, spaced at a maximum of 150 mm o/c.

(i) Subdrain pipe installed within the granular bedding shall have two rows of holes: pipe holes shall be positioned at 4 o'clock and 8 o'clock; holes may be aligned or alternating.

(ii) Subdrain pipe for connection pieces between drains embedded in granular bedding, wick drain connection pipe, extension pipes for subdrain cleanouts, and for extension of drain outlet pipes shall not be perforated.

(b) All other drain pipes, fittings, and other accessories and appurtenances shall conform to the requirement of Standard Construction Specification CW 2130-R12 and CW3120-R4.

E17.7 Drainage Fabric

(a) Drainage fabric shall be in accordance with CW3120-R4 or as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

E17.8 Drainage Material

(a) Drainage material shall be in accordance with Specification CW 3120-R4.

(i) Cement Patching Compound

E17.9 Riprap and Geotextile

(a) Riprap and geotextile material shall be in accordance with Specification CW 3615 – R4 or as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

EQUIPMENT

E17.10 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E17.11 Subdrain Systems

(a) Install a perforated subdrain pipe system as shown on the Drawings. The supply and installation of this subdrain pipe system shall include the drain pipe, all required fittings, drain pipe drainage materials, and the filter fabric. Install subdrains as shown on the Drawings.

(b) The subdrain shall be installed in accordance with the City of Winnipeg Standard Detail SD-245.

(c) The minimum clearance between subdrain and all concrete substructure components shall be 500mm.

(d) Non-perforated subdrain pipes shall be installed connecting to the perforated subdrains and terminating at the bae of the embankments as shown on the Drawings.

(e) The drain pipe shall be laid to the line and grade shown on the Drawings or as directed by the Contract Administrator with the separate sections securely jointed together by means of watertight solvent welded joints or watertight rubber bell-and-spigot joints, with the bell on the downstream side of the connection. All bent joints shall be solvent welded.

E17.12 Drainage Pad

(a) Riprap drainage pads shall be constructed at the drain termination points as shown on the drawings.

(b) Geotextile shall be placed to separate riprap from native soils in accordance with Specification CW 3615 – R4, or as accepted by the Contract Administrator.

QUALITY CONTROL AND ASSURANCE

E17.13 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.

E17.14 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.

MEASUREMENT AND PAYMENT

E17.15 Subdrain Systems

(a) The supply and installation of the subsurface drainage system will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for “Supplying and Placing Subsurface Drainage”, which price will be payment in full for supplying all materials / equipment and for completing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E18. STRUCTURAL BACKFILL

DESCRIPTION

E18.1 General

(a) This Specification covers all operations relating to supplying and placing granular backfill at locations shown on the Drawings and to the requirements of this Specification.

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

E18.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Standard Construction Specification CW 3110 – R22

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

E18.3 Scope of Work

(a) The Work under this Specification shall include the following items, which are incidental to the Work:

(i) Placement and compacting of fill, including granular base for the approach slabs, grade beams, and concrete slope protection.

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

MATERIALS

E18.4 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 Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related Works shall be in accordance with CW 3110 Granular A – 50mm.

(v) 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.

EQUIPMENT

E18.5 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E18.6 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 ninety-eight percent (98%) 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.

QUALITY CONTROL AND ASSURANCE

E18.7 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 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.

MEASUREMENT AND PAYMENT

E18.9 Structural Backfill

(a) The backfilling required for Lagimodiere Twin Overpasses over CPKC Keewatin Rehabilitation and Related 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.

E19. STABILIZED ABUTMENT FILL

DESCRIPTION

E19.1 General

(a) This Specification covers all operations relating to the supply and placing of the stabilized fill underneath the proposed structural slabs and behind the abutments.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of the 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.

REFERENCES

E19.2 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Standard Construction Specification CW 2160 – R8

SCOPE OF WORK

E19.3 The Work under this Specification shall include the following items, which are incidental to the Work:

(a) Installation and removal of formwork for stabilized abutment fill

(b) Supply and installation of cement – stabilized abutment fill between wingwalls underneath structural slab

SUBMITTALS

E19.4 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.

(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 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.

MATERIALS

E19.5 General

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

E19.6 Flowable Cement

(a) Cement for stabilized fill shall meet the requirements for Cement – Stabilized Fill described in Standard Construction Specification 2160-R8 – Concrete Underground Structures and Works

CONSTRUCTION METHODS

E19.7 General

(a) Cement stabilized fill shall not be placed in direct contact with any existing or proposed bridge structure elements.

(b) Cement stabilized fill shall not be placed prior to installation of steel piles for proposed grade beams.

QUALITY CONTROL AND QUALITY ASSURANCE

E19.8 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.

E19.9 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.

MEASUREMENT AND PAYMENT

E19.10 Stabilized Abutment Fill

(a) The supply and placing of the stabilized abutment fill will be measured in cubic meters of stabilized abutment fill. The quantity of cubic meters to be paid for will be the total quantity of cubic meters of stabilized abutment fill placed as authorized by the Contract Administrator. The supply and placing of stabilized abutment fill will be paid for at the Contract Unit Price per cubic meter for “Stabilized Abutment Fill”, which price shall be payment in full for supplying and placing all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E20. SUPPLY AND DRIVING STEEL PILES

DESCRIPTION

E20.1 General

(a) This Specification shall cover all operations related to the pre-boring for piles, supplying, handling, hauling, storing, supplying and installing pile tips, aligning and driving, splicing, and cutting off of piles at the required elevations for steel piles.

(b) Steel piles, steel "H" piles, and "H" Piles shall be considered one and the same for the Drawings and this Specification.

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

REFERENCES

E20.2 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CAN/CSA G40.20M/G40.21M-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

(b) CSA W59, Welded Steel Construction (Metal Arc Welding).

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

(d) City of Winnipeg's Approved Products List.

SUBMITTALS

E20.3 The Contractor shall submit the following to the Contract Administrator:

(a) Copies of Mill Test Certificates showing chemical analysis and physical tests for piling material. Piling material without this certification will be rejected.

(b) Details of the proposed pile driving system and manufacturer's specifications and catalogue for all mechanical hammers to be used to perform preconstruction wave equations analysis and determine adequacy of the driving system and hammer and the preliminary pile driving criteria.

(c) Certificate of mass for gravity or drop hammers. If this certificate is not available, the gravity or drop hammers shall be weighed in the presence of the Contract Administrator. Hammers so weighed shall have the exact mass marked on them. Gravity hammers shall weigh at least 1.5 ton but in no case shall the mass of the hammer be less than the combined mass of the pile and pile cap.

(d) Proof of certification for the welders conducting the Work (if applicable). All welders shall satisfy one of the following requirements:

(i) Welders qualified in accordance with the requirements of AASHTO/AWS D1.5M/1.5,

(ii) Valid Canadian Welding Bureau (CWB) Welding ticket, or

(iii) Valid "Welder's Licence" as issued by the Mechanical and Engineering Division.

(e) Department of Labour and Manpower, Province of Manitoba, with a minimum of 5 years of experience welding on steel structures.

(f) Welding procedures specific to the Work.

(g) Pile layout shop drawings indicating the Contractor’s plans for pile lengths and splice locations based on proposed cutoff elevations and anticipated top elevations. No pile materials shall be ordered or installed until the Contractor’s pile layout submission has been approved by the Contract Administrator.

MATERIALS

E20.4 General

(a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

E20.5 Handling and Storage of Materials

(a) Piling shall be handled, hauled and stored in a manner that avoids damage to the piling materials. Loading and unloading shall be by crane, loader or other appropriate hoisting equipment.

(b) The method of handling and storing steel piles shall be such so as to prevent any damage to the pile and to ensure that the design strength will not be affected by deterioration or deformation. The Contractor, in handling or lifting the piles, will not be permitted to drag them 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 by the Contractor, at his own expense.

E20.6 Steel "H" Piles

(a) Steel "H" Piles shall be structural HP310 x 110 steel members manufactured in accordance with CAN/CSA-G40.20M/G40.21M-04, Grade 350W.

E20.7 Pile Tips

(a) Pile tips shall conform to CAN/CSA-G40.20M/G40.21M-04 Grade 300W. Pile tips shall be Hard-Bite Point Model No. HP-77750-B.

E20.8 Splice Plates

(a) Splice plates shall conform to the requirements of CAN/CSA G40.21M, Grade 300W.

E20.9 Welding

(a) The Contractor is responsible for supplying all welding materials. All welding materials shall conform to the requirements of Welded Steel Construction (Metal Arc Welding).

(b) All welding shall conform to the latest CSA Standard W59, electric arc method.

CONSTRUCTION METHODS

E20.10 Location and Alignment of Piles

(a) The piles shall be located at the positions shown on the Drawings or as directed by the Contract Administrator. Piles shall be driven vertically unless shown otherwise on the Drawings, and shall not deviate more than 2 per cent out-of-plumb. Battered piles shall be driven to the battered specified on the Drawings, and shall not deviate more than 2 per cent from the batter specified. Piles shall not be more than 50 mm off centre measured at cut-off elevation.

(b) Pile spacing shall be measured at the underside of the concrete pile cap.

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

E20.11 Driving of Piles

(a) The pile driving system used by the Contractor shall be capable of advancing the steel “H” piles to achieve the minimum to the minimum factored capacity (ULS) without damage being done to the piles. The driving equipment should be in good working condition and operating in a manner within the manufacturers recommendations. As a minimum, a hammer capable of delivering a rated energy of 45kJ to the pile head shall be used, and must have the ability to reliably operate at different energy levels (e.g. different fuel settings, variable stroke, variable ram weight, etc.)

(b) All piles shall be driven completely prior to the placement of Stab concrete backfill underneath the proposed structural slab as shown on the Drawings..

(c) All pile driving points shall be welded by the Contractor prior to commencement of pile driving operations, incidental to the works of this Specification.

(d) The piles shall be driven to the approximate tip elevations as shown on the Drawings except when required by the Contract Administrator, the piles shall be driven to a factored

capacity (ULS) of 1500 kN based on pile dynamic analyser (PDA) test. Prior to the pile construction, the acceptability of the pile driving system and the required set criteria shall be determined by the wave equation analysis. The set criteria shall be confirmed during construction by E21 Pile Dynamic Analyser (PDA) Testing.

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

(f) Piles covering a large area or in groups, shall be driven working out from the centre of the area or group to ensure that the piles at the boundaries are in their correct final positions.

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

(h) Pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane so as to hold the piles securely and accurately in the 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 incline leads.

(i) The heads of the steel piles shall be squared and protected by a cap of a design approved by the Contract Administrator. The 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 shock block.

(j) If, during the piling operations, upheaval of pile occurs, the Contractor will be required to redrive the lifted piles down to their original elevations. The Contractor will also be required to excavate material that has boiled up during pile driving operations. The elevation of all piles previously driven or redriven shall be observed to detect uplift. If uplift of 5 mm or more occurs in any pile, that pile shall be redriven to its original elevation and thereafter to the required final driving resistance.

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

(l) 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 install the piles as directed by the Contract Administrator. Abandoned pile will be paid in accordance with this specification.

(m) Preboring will not be allowed unless it is approved in writing by the Contract Administrator.

(n) If, in the judgement of the Contract Administrator, the Contractor is unable to complete properly any pile or piles driven to replace the original pile in the Contract, they shall be abandoned. Piles abandoned, because of obstructions encountered before reaching the accepted bearing strata, shall be cut off at the cut-off elevation and paid for as outlined hereinafter.

(o) The Contractor shall ensure the safety of all personnel during pile driving operations.

E20.12 Splicing of Piles and Installing Pile Tips

(a) Full-length piles shall be used where practicable. Where anticipated pile lengths require, splicing of piles will be permitted. The method of splicing shall be as shown on the Drawings, welding procedures, shop drawings and the following:

(i) The butting ends of the driven pile and its extension or the pile and the pile tip shall be cut square to give reasonable bearing between the matting surfaces.

(ii) All butting surfaces shall be 100 per cent butt welded.

(iii) The butting surface of the extension piece shall be bevel cut at 45° to facilitate a full-penetration butt weld. Temporary clamping plates may be used as required.

(iv) Before welding over previously-deposited metal, the slag shall be cleaned off. This requirement shall apply to successive layers, to successive beads, and to the cratered area when welding is resumed after any interruption.

(v) All butt welds shall have the root of the initial weld gouged, chipped, or otherwise removed to sound metal before welding is started from the second side.

(vi) The piles shall not have more than one splice per pile unless otherwise approved by the Contract Administrator.

(vii) Splices should be located at least 5.0 m below the underside of the pile cap and shall be a moment splice as detailed on the Drawings.

(viii) Splices shall be located such that no more than 50 per cent of the piles are spliced at the same elevation.

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

(x) The pile material shall be preheated to a minimum of 100°C for a distance of 80 mm beyond the weld and shall be sheltered from the wind if the air temperature is below freezing.

(xi) When the air temperature is below -18°C, welding will not be permitted unless suitable hoarding is in place.

E20.13 Defective Piles

(a) The pile driving procedures shall not subject the piles to excessive and undue abuse producing deformation of the steel. Manipulation of piles to force them into proper position will not be permitted.

(b) Piles damaged by improper driving, or driven out of proper location, or driven below the cut-off elevation, shall be corrected by one of the following methods accepted by the Contract Administrator:

(i) The piles shall be withdrawn and replaced by new, if necessary, longer piles, or

(ii) Replacement piles shall be driven adjacent to defective or low piles, or

(iii) The piles shall be spliced or built up, as otherwise provided herein, or a sufficient portion of the footing extended to properly embed the piles. All piles, pushed up by the driving of adjacent piles or by any other cause, shall be driven down again.

(c) In the case of required penetration and bearing capacity are not obtained, the Contractor shall provide a hammer of greater energy, as applicable, or when accepted by the Contract Administrator, resort to pre-drilling.

E20.14 Cut-Off of Piles

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

(b) Unless determined otherwise by the Contract Administrator, cut offs shall become the property of the Contractor and shall be removed from the Site.

(c) Proposed pile lengths and splice locations shall be planned to minimize the amount of pile cutoff waste that is anticipated.

E20.15 Steel Pile Extensions

(a) Steel pile extensions shall be avoided, but when necessary and as directed by the Contract Administrator, they shall be made in accordance with E20.12.

QUALITY CONTROL

E20.16 Inspection

(a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator,

including all operations, from the selection and production of materials, through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

(b) The Contractor shall provide a detailed survey of all of the pile locations for a pile cap (foundation) and provide that to the Contract Administrator prior to cutting off any piles for that pile cap.

(c) The Contractor shall replace any piles, or add additional pile(s), for piles that do not meet the specified refusal criteria or do not meet the following tolerances: +/-2% out of alignment for battered piles, +/-2% out of plumb for vertical piles, and 75 mm off centre of the specified locations. Any modifications required to the pile cap, due to piles out of tolerance or due to required additional piles to compensate for out of tolerance piles, shall be carried out as specified by the Contract Administrator at the Contractor's own costs.

E20.17 Access

(a) The Contractor Administrator shall be afforded full-access for the inspection and control testing of the precast piles at the Site of Work to determine whether the steel piles are being supplied in accordance with this Specification.

E20.18 Pile Driving Records

(a) The Contract Administrator will keep a record of each and every pile driven. The records shall give the date, time, size, length, location, type, total depth of penetration, rate of penetration, number of blows per 300 mm, penetration for the last five blows, steam, air or diesel pressure, and any kind and size of hammer used in driving. Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.

(b) Energy output of driving equipment at the time of final set shall be carefully recorded, along with the final penetration readings, and reported immediately to the Contract Administrator. The required set per blow will be subject to approval by the Contract Administrator, showing regard to the specific driving equipment and piles permitted.

MEASUREMENT AND PAYMENT

E20.19 Steel Piles

(a) Supplying steel piles will be measured in lineal meters of piling. The number of lineal metres to be paid for will be the total number of lineal metres of piling unloaded and stockpiled at the Site as authorized by the Contract Administrator. The supply of steel piles will be paid for at the Contract Unit Price per linear metre for "Supply Steel Piles", 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.

(b) Driving steel piles will be measured in lineal metres of piling. The length to be paid for will be the total number of lineal metres driven, less 50% of the total number of lineal metres of piling cut off after driving. Cut offs will be measured by the Contract Administrator in the presence of the Contract. Driving steel piles will be paid for at the Contract Unit Price per linear metre for "Drive Steel Piles", 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.

(c) Pre-Boring of piles will be considered incidental to the supplying and driving steel piles and no separate measurement will be made of this work.

E20.20 Pile Tips

(a) Supplying pile tips will be measured on a unit basis and the number to be paid for will be the total number of pile tips supplied as accepted by the Contract Administrator. Supplying pile tips will be paid for at the Contract Unit Price per pile tip for "Supply of Pile Tips", for

performing all operations herein described and all other items incidental to the Work included in this Specification.

(b) Installation of pile tips will be measured on a unit basis and the number to be paid for will be the total number of pile tips installed as accepted by the Contract Administrator. Installation of pile tips will be paid for at the Contract Unit Price per pile tip for "Installation of Pile Tips", for performing all operations herein described and all other items incidental to the Work included in this Specification.

E20.21 Splicing Steel Piles

(a) Splicing steel piles will be measured on a unit basis and the number to be paid for will be the total number of splices performed by the Contractor and as accepted by the Contract Administrator. Splicing of steel piles will be paid for at the Contract Unit Price for "Splicing Steel Piles", for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E21. PILE DYNAMIC ANALYSER (PDA) TESTING

DESCRIPTION

E21.1 General

(a) The dynamic testing shall be performed by the Contractor to monitor and confirm hammer and driving system performance, assess pile installation stresses and integrity, as well as to evaluate pile capacity. The Contract Administrator shall secure the services of an independent Dynamic Testing Consultant with demonstrated experience in similar projects. Dynamic testing shall be performed on two (2) piles; one (1) per bridge. At least fourteen (14) day's notice is required by the Contract Administrator to arrange for a testing company to conduct the dynamic testing work.

(b) The steel piles selected for PDA testing will become part of the permanent piling for the substructure units.

(c) Dynamic testing involves attaching two strain transducers and two accelerometers to the pile approximately three (3) pile diameters below the pile head during initial driving and at a convenient location near the pile head during re-strike testing. A cable connects the gages with the Pile Driving Analyzer located at ground level and at a safe place near the pile to collect the dynamic measurements.

REFERENCES

E21.2 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) ASTM D-4945-00, "Standard Test Method for High Strain Dynamic Testing of Piles".

(b) Specification E20 Supply And Driving Steel Piles.

SUBMITTALS

E21.3 At least fourteen (14) days prior to driving the test piles, the Contractor shall submit Specifications for the pile driving equipment to the Contract Administrator.

EQUIPMENT AND PERSONNEL

E21.4 The dynamic testing work will be carried out using the Contractor's pile driving equipment and the Pile Driving Analyzer (PDA) equipment provided by the Dynamic Testing Consultant.

E21.5 The PDA testing equipment shall conform to the requirement of ASTM D-4945-00, "Standard Test Method for High Strain Dynamic Testing of Piles". An Engineer with documented experience shall operate the Pile Driving Analyzer in the field. A Geotechnical Engineer

registered in Manitoba with at least five years related experience shall carry out the analysis of the PDA data and seal the engineering reports.

E21.6 The Contractor shall provide the pile driving equipment, operators, labor and power supply to the test pile locations for the duration of the dynamic testing. The Contractor shall provide a step ladder or other safe lifting means to enable attachment of cables to the pile head. The pile driving equipment shall be the same as that to be used for the pile driving work. The power supply shall consist of a regular power source (line power or portable generator) providing 1,800 watts of 115 volt AC power with a frequency of 60 Hz. Direct current welders or non- constant power sources are unacceptable.

EXECUTION

E21.7 Construction Access

(a) Prior to lifting the pile to be dynamically tested, the Contractor shall provide a minimum of one (1) m of clear access around the pile head for pile preparation. The Dynamic Testing Consultant shall then drill and prepare holes for gage attachment.

(b) The Dynamic Testing Consultant shall attach the gages to the pile after the pile has been driven to the depth identified by the Contract Administrator. Driving shall then continue using routine pile installation procedures. When the level of the gages is within 0.3 m of the ground surface, water surface, or a pile template, driving shall be halted to remove the gages from the pile. If additional driving is required, the pile shall be spliced and the gages shall be reattached to the head of the extension pile segment prior to the resumption of driving.

(c) The Contractor must take good care to ensure that no damage is done to the dynamic monitoring transducers, cables, or equipment.

TESTING PROCEDURES

E21.8 Preconstruction Wave Equation Analyses

(a) After the Contractor had submitted Specifications for the pile driving equipment to the Contract Administrator. The Dynamic Testing Consultant shall use the submitted information to perform wave equation analysis and shall prepare a summary report of the wave equation results. The wave equation analyses shall be used to assess the ability of the proposed driving system to safely install the pile to the required capacity and/or desired penetration depth within the allowable driving stresses.

(b) Approval of the proposed driving system by the Contract Administrator shall be based upon the wave equation analyses indicating that the proposed driving system can drive the pile to achieve the required static pile capacity of at least 2.0 times the pile design capacity at a driving resistance not greater than 15 blows per 25 mm penetration, within allowable driving stress limits for the pile material.

(i) Maximum allowable driving stresses (tension and compression) for Steel Piles:= 0.90 fy

(c) A new pile driving system, modifications to existing system, or new pile installation procedures shall be proposed by the Contractor if the results of the wave equation analysis indicate that the required capacity is not achieved, excessive blows are required (i.e. greater than 15 blows per 25 mm) or driving stresses exceed the maximum allowable limits.

E21.9 Dynamic Testing Program

(a) Approximately two days before the pile evaluation work is to be undertaken, the Contractor and Contract Administrator shall meet on-site to select the piles that will be evaluated. The selected piles shall be driven to attain static capacity of at least 2.0 times the pile design capacity. Adjustments to the preliminary driving criteria may be made by the Contract Administrator based upon the dynamic testing results. All or part of the tested piles as determined by the Contract Administrator shall be re-struck with dynamic testing after a

minimum waiting period of seven (7) days, to evaluate the setup effect on pile capacity. The recommended setup waiting period will be determined from this testing program.

(b) The re-strike driving sequence shall be performed with a warmed up hammer and shall consist of striking the piles for about 10 blows to 20 blows or until the pile penetrates an additional 50 mm, whichever occurs first.

E21.9.1 The Contract Administrator may request additional piles to be dynamically tested if the hammer and/or driving system is replaced or modified, the pile type or installation procedures are modified, the pile capacity requirements are changed, unusual blow counts or penetrations are observed or any other piling behaviour that differs from normal installation.

E21.10 Dynamic Testing Reports

(a) Within one (1) day pile testing, the Dynamic Testing Consultant shall prepare a hand written daily field report summarizing the dynamic testing results. As a minimum, the daily reports shall include the calculated driving stresses, transferred energy, and estimated pile capacity at the time of testing. Variations from previous trends in the dynamic test data shall also be noted. Daily field reports shall be faxed or emailed to the Contract Administrator.

(b) The Dynamic Testing Consultant shall prepare and submit a written report not later than seven (7) days after the test completion. This report shall include the results of dynamic test(s) and shall contain a discussion of the pile capacity obtained from the dynamic testing. The report shall also discuss hammer and driving system performance, driving stress levels, and pile integrity. CAPWAP analyses shall be performed on dynamic testing data obtained from the end of initial driving and the beginning of re-strike of all tested piles or as instructed by the Contract Administrator. CAPWAP analyses shall be performed by a Geotechnical Engineer registered in Manitoba with at least five (5) years related experience.

(c) The Contract Administrator may request additional analyses at selected pile penetration depths.

MEASUREMENT AND PAYMENT

E21.11 Performing Pile Dynamic Analyser (PDA) Testing of steel piles will be paid for at the Contract Unit Price per pile for “Pile Dynamic Analyzer (PDA) Testing, measured as specified herein, 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. This shall also include all costs associate with the PDA testing, pile set up for BOR, pile re-striking and all labour equipment, tools, and incidentals necessary to complete the Work.

E22. SUPPLYING AND PLACING REINFORCING STEEL

DESCRIPTION

E22.1 General

(a) 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.

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

E22.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

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

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

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

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

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

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

E22.3 Scope of Work

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

E22.4 Submittals

(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 E22.16.

MATERIALS

E22.5 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.

E22.6 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.

E22.7 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 E22.1, "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 E22.1: 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

E22.8 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 B6.

(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.

EQUIPMENT

E22.9 General

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

CONSTRUCTION METHODS

E22.10 Fabrication of Reinforcing Steel

(a) 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.

E22.11 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.

E22.12 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. 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 E22.8, “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.

E22.13 Splicing

(a) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings shall not be permitted without the written approval of the Contract Administrator.

(b) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings.

QUALITY CONTROL AND ASSURANCE

E22.14 Inspection

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

E22.15 Access

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

E22.16 Quality Testing

(a) Quality control testing may be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

(b) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

MEASUREMENT AND PAYMENT

E22.17 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 and Delivery Reinforcing Steel
  (i) Black Steel Reinforcing
  (ii) Stainless Steel Reinforcing

(b) Placing Reinforcing Steel
  (i) Black Steel Reinforcing
  (ii) Stainless Steel Reinforcing

E22.18 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" and "Placing Reinforcing Steel", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E23. STRUCTURAL CONCRETE

DESCRIPTION

E23.1 General

(a) 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.

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

E23.2 References

(a) The latest edition and subsequent revisions of the following:
  (i) American Concrete Publication SP4 – Formwork for Concrete;
  (ii) ASTM A1035 – Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement;
  (iii) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes;
  (iv) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;
  (v) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;
  (vi) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;
  (vii) ASTM C881- Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;
  (viii) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;
  (ix) ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete;
  (x) ASTM C1609 – Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third Point Loading);
  (xi) ASTM C1876 – Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete;
  (xii) CSA A23.1 – Concrete Materials and Methods of Concrete Construction;
  (xiii) CSA-A3001 – Cementitious Materials for Use in Concrete; and
  (xiv) CSA O121 – Douglas Fir Plywood.

(b) E15.17 for bridge deck and girder survey

E23.3 Scope of Work

(a) The Work under this Specification shall include:

(i) Supplying and placing structural concrete for bridge deck slab, girder diaphragms and bridge traffic barriers;

(ii) Supplying and placing structural concrete for structural slabs and approach slabs;

(iii) Supplying and placing structural concrete for grade beams;

(iv) Supplying and placing structural concrete for south embankment concrete slope protection; and

(v) Supplying and placing structural concrete for the pier and abutment modifications.

E23.4 Submittals

(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.

E23.5 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.

E23.6 Concrete Mix Design Test Data

E23.6.1 Concrete

(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, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

(b) 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-S6-19, Section 16, Fibre Reinforced Structures, Clause 16.6.

(c) 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).

(d) 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.

E23.6.2 Aggregates

(a) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in

order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(b) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.

(c) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

(d) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

(e) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

(f) 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.

(g) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

(h) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E23.6.3 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier they are 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.

E23.6.4 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:

- 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.

E23.6.5 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.

E23.6.6 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.

E23.6.7 Screed for Deck Slab Concrete

(a) Plans for anchoring support rails shall be submitted tothe 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.

E23.6.8 Concrete Deck Slab Pour Sequence and Schedule

(a) The Contractor shall pour the deck slab concrete in accordance with the pour sequence as outlined in the Drawings. 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.

E23.6.9 Concrete Deck Overhang Formwork and Construction Loads

(a) The assumed loads and dimensions of the temporary construction loads that have been accounted for in the strength design of the girder(s) are shown on the Plans.

(b) The Contractor shall confirm as part of their required submissions if their applied overhang construction loading is less than or equal to the supplied loading information for which the girder(s) have been designed for.

(c) If the Contractor’s applied loading is greater than stated on the Plans, the Contractor shall provide a submission for approval that confirms the structural capacity of the girder(s) are adequate for the Contractor’s intended applied loads, and the manner in which the girder(s) will be supported, which shall be sealed, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba.

E23.6.10 Girder Temporary Construction Bracing

(a) Girder bracing requirements during construction are noted on the Drawings. Girder bracing is required to laterally brace the existing concrete girders during construction following removal of the existing bridge deck and prior to the completion of curing of new concrete bridge deck.

(b) Girder bracing is also required to establish longitudinal connectivity of the girders across the pier substructures for thermal movement of the girders during construction prior to new deck and diaphragm casting.

(c) The girder temporary braces shall be installed following the demolition of the existing bridge deck. No deck overhang formwork shall be installed on the girders until the temporary bracing is installed.

(d) Components of the temporary girder bracing are permitted to remain permanently in the new concrete deck, provided that:

- Proper concrete cover is maintained;
- Any material that extends past the mid-depth of the concrete deck is made of a suitable non-corrosive material;

- Proper spacing around components and deck reinforcing is maintained to permit flow of concrete and aggregate; and
- There are no long term negative effects on the permanent structure, such as but not limited to contact of dissimilar metal, subject to the approval of the Contract Administrator.

(e) The Contractor shall provide a submission for approval to confirm the design and installation methodology of the girder temporary braces, which shall be sealed, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba.

MATERIALS

E23.7 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.

E23.8 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.

E23.9 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.

E23.10 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.

E23.11 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 E23.1.

Table E23.1: 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	Bridge Super-structure, Structural Slabs,	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
	Approach Slabs						
Type 2	Slope paving	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15
Type 3	Abutment and Pier Modifications	35 @ 28 Days	C-1	1	20 mm		
Type 4	Grade Beams	35 @ 56 Days	S-1	2	20 mm		

E23.12 Bearing Pedestal Concrete

(a) Concrete for abutment bearing pedestals shall be supplied, placed, and paid for in accordance with the Specification E25 “Self Consolidating Concrete Repairs”.

E23.13 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.

E23.14 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.

E23.15 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.

E23.16 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.

E23.17 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.

E23.18 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.

E23.19 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.

E23.20 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 B5.

E23.21 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B5. 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.

E23.22 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.

(b) Curing compound for concrete slope protection 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 B6.

E23.23 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 B5.

E23.24 Bonding Agents

E23.24.1 Latex Bonding Agent

(a) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B5. 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.

E23.24.2 Bonding Grout

(a) 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.

(b) 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.

E23.25 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 B6 “Substitutes”.

E23.25.1 Epoxy Grout

(b) 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 B6 “Substitutes”.

E23.26 Cementitious Grout

(a) Cementitious grout shall be nonshrink and nonmetalic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B5. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E23.27 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.

E23.28 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 “Substitutes”.

E23.29 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 B6 “Substitutes”.

E23.30 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:

- Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone;
- Field-applied epoxy adhesive primer; and,
- 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:

- 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,
- 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.

E23.31 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 B6 “Substitutes”.

E23.32 Low Density Styrofoam

(a) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

E23.33 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%.

E23.34 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 B6 “Substitutes”.

(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 B6 “Substitutes”.

E23.35 Dampproofing

(a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

(b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.

(c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable products are Bakor Penetrating 910-01 Asphalt Primer as manufactured by Bakor Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof & Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

E23.36 Anchor Units for Street Light Poles

(a) Anchor units for street light pole shall be stainless steel Acrow-Richmond Type DGRS-2FS or equivalent approved under B6 “Substitutes”.

E23.37 Street Lighting Conduits

(a) Conduits for street lighting poles shall be 50 mm dia. PVC in accordance with E77 “Conduits”.

MISCELLANEOUS MATERIALS

E23.38 General

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B6 “Substitutes”.

(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.

E23.39 Bridge Electrical

(a) Electrical conduit cast into the concrete deck shall be installed and paid for in accordance with Specification E77 “Conduits”.

(b) External conduits and all other components associated with the underbridge lighting installed on the piers shall be in accordance with Electrical Specifications E72, E75, E76, E77, and E84.

EQUIPMENT

E23.40 General

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

E23.41 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.

E23.42 Placing and Finishing Equipment for Bridge Deck Concrete, Roof Slabs, 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 supported on the exterior girders and not on the deck overhang formwork. 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.

CONSTRUCTION METHODS

E23.43 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.

E23.44 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.

E23.45 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 E23.54, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E23.46 Bridge Deck Screeds

(a) Setting Deck Screeds

(i) The Contractor shall adjust screeds to maintain uniform slab thickness. Adjust screed 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.

(ii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

(iii) Prior to the Contractor setting bridge girder haunch heights and screed profile, the Contractor shall perform a beam shot survey and submit result to the Contract Administrator a minimum of five (5) days before haunch heights and screed elevations are set. Beam shot survey shall be in accordance with E15.17, “Bridge Deck Survey”.

E23.47 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.

E23.48 Anchor Units for Streetlights

(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.

E23.49 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.

E23.50 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.

E23.51 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.

E23.52 Approach Slabs Works

(a) The Contractor shall undertake the approach slab Works, as shown on the Drawings.

E23.53 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 E23.1, “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:

Limit the amount to be placed at any time (using adequate construction joints);

Augment his facilities and Plant in order to complete the proposed placement; and,

In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.

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

E23.54 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 concrete deck, approach slabs, and structural slabs, during concreting of the deck, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E23.55 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 structural slabs, 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.

E23.56 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 Section E23.59 of this Specification.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces shall be finished as outlined hereinafter.

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish – Surfaces Below Finished Grade

(i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Section E23.59 of this Specification.

(ii) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E23.35 of this Specification.

(e) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

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

(f) Concrete Bridge Deck Finish

(i) If the hot-poured rubberized asphalt waterproofing membrane is installed on the concrete bridge deck prior to vehicular traffic being allowed on the bridge, than the bridge deck concrete shall be finished in accordance with E23.56(c).

(ii) If the construction staging requires that vehicular traffic be placed on the bridge prior to the installation of the hot-poured rubberized asphalt waterproofing membrane, then a broomed surface finish shall be applied to concrete deck surface.

(iii) Brooming shall be done when the concrete has hardened sufficiently. The broom shall be of an approved type.

(iv) Each broom stroke shall be continuous for the full width of the slab being finished, and at a right angle to the centreline of roadway. Only one (1) stroke per width of the broom will be acceptable with adjacent strokes slightly overlapped.

(v) The broom shall be drawn evenly without tearing of the concrete to produce regular corrugations of 2 mm in depth.

E23.57 General Curing Requirements

(a) Refer to E23.60 for cold weather curing requirements and E23.61 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.

E23.58 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.

E23.59 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.

E23.60 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.

E23.61 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 E23.2, “Acceptable Concrete Temperature”, for the indicated size of the concrete section.

Table E23.2: Acceptable Concrete Temperatures

THICKNESS OF SECTION	TEMPERATURE °C	
	MINIMUM	MAXIMUM
Less than:		
1.0 m	10	27
1.2 m	5	25

(e) Clean-up

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

E23.62 Bridge Conduit

(a) Electrical conduit cast into bridge concrete deck shall be supplied and paid for in accordance with Specification E77 “Conduits”.

(b) Electrical conduit shall be installed as shown on the Drawings.

QUALITY CONTROL AND ASSURANCE

E23.63 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 in E23.64(e).

(j) Contract Administrator shall undertake a cover meter survey of top of bridge deck and inside face of barriers. Concrete areas not within specified tolerances will be rejected.

E23.64 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 E23.64(e)(vii). Testing shall include the specified number of specimens from deck slab concrete, structural slab concrete, approach slab concrete, traffic barrier concrete, and concrete slope protection concrete. The Contractor shall promptly submit a summary of the test results to the Contract Administrator upon the conclusion of each test.

(vi) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".

(vii) 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".

(viii) 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.

(ix) 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 E23.1of 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.

MEASUREMENT AND PAYMENT

E23.65 General

E23.65.1 Supplying and placing structural concrete will not be measured. This Work shall be paid for at the Contract Unit Price for the “Items of Work” listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(a) Items of Work:

Supply and Place Structural Concrete:

(i) Bridge Deck & Diaphragms
(ii) Concrete Barriers
(iii) Approach Slabs
(iv) Grade Beams
(v) Pier Modifications
(vi) Abutment Modifications
(vii) Structural Slabs
(viii) Concrete Slope Protection

(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.

(c) Heating concrete and housing and heating deposited concrete will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

E24. DRILLING AND PLACING DOWELS

DESCRIPTION

E24.1 General

E24.1.1 This Specification shall cover all operations related to drilling and preparation of dowel holes, supply and placing epoxy grout and installation of the applicable anchorages.

(a) Dowels shall include the following post-installed anchorages and reinforcing bars:
  (i) Dowels for pier and abutment modifications;
  (ii) Dowels for concrete girder top flange shear connection replacements
  (iii) Dowels for anchoring new concrete abutment and pier diaphragms into existing girders;
  (iv) Through dowels for girder diaphragms

E24.1.2 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.

E24.2 References

E24.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Specification E15, Structural Removals
(b) Specification E23, Structural Concrete
(c) Specification E22, Supplying and Placing Reinforcing Steel
(d) Specification E25, Self Consolidating Concrete Repairs

E24.3 Scope of Work

E24.3.1 The Work under this Specification shall include the following items to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(a) Dowels shall include the following post-installed anchorages and reinforcing bars:
  (i) Dowels for substructure modifications;
  (ii) Cored dowels for pier modifications;
  (iii) Dowels for concrete girder top flange shear connection replacements;
  (iv) Dowels for anchoring new concrete abutment and pier diaphragms into existing girders;
  (v) Through dowels for girder diaphragms;
  (vi) All other dowels shown on the Drawings

E24.4 Submittals

E24.4.1 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 for the drilling and placing of dowels, including the process for locating any existing reinforcing within existing concrete elements.

E24.4.2 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.

MATERIALS

E24.5 General

(a) Epoxy grout shall be Hilti HIT-RE 500-V3 or equivalent as approved by the Contract Administrator. The epoxy grout shall be suitable for horizontal, vertical or overhead dowel grouting application as required.

EQUIPMENT

E24.6 General

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

CONSTRUCTION METHODS

E24.7 General

(a) In abutments, piers, and concrete girders, the Contractor shall core or drill holes and place dowels at the locations and in accordance with the details as shown on the Drawings and the epoxy grout manufacturer's direction.

(b) The Contractor shall predetermine the locations of existing steel bars prior to drilling or coring, using an effective reinforcing steel bar locator as approved by the Contract Administrator. Dowel hole locations as shown on the Drawings, shall be relocated as required to avoid conflicts with existing reinforcing steel bars as approved by the Contract Administrator.

(c) Dowel hole diameters shall be in accordance with the recommendations of the epoxy adhesive grout manufacturer.

(d) All holes shall be thoroughly cleaned prior to the installation of grout and dowels.

(e) The epoxy adhesive grout shall be prepared, placed and cured in accordance with the recommendations of the epoxy adhesive grout manufacturer.

E24.8 Girder Top Flange

(a) Following removal of the existing concrete dec, the Contractor shall provide access to the Contract Administrator to inspect the existing reinforcing bars extending from the top of the existing concrete girders into the proposed deck

(b) Where, in the Contract Administrator's assessment, the existing reinforcing is deficient, the Contractor shall install new dowels into the girder as directed by the Contract Administrator and as per details on the Drawings.

(c) Where, in the Contract Administrator's assessment, the damage to the existing steel was caused by the Contractors efforts in demolition of the concrete deck, the Contractor shall install replacement dowels at no cost to the City.

E24.9 Through Dowels for Girder Diaphragms

(a) The Contractor shall drill or cores holes through the existing girder end blocks as noted on the Drawings.

(b) Contractor shall locate existing girder reinforcing and mark locations prior to drilling. Contractor Administrator shall review hole locations prior to drilling.

QUALITY CONTROL AND ASSURANCE

E24.10 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.

E24.11 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.

MEASUREMENT AND PAYMENT

E24.12 General

(a) Drilling and placing dowels will paid for at the Contract Unit Price per dowel for the “Items of Work” lister 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.

E24.13 Items of Work:

(a) Drilling and Placing Dowels
  (i) Substructure Modifications
  (ii) Girder Top Flange
  (iii) Girder Ends
  (iv) Through Dowels for Girder Diaphragms

E24.14 The supply and installation of reinforcing steel for the dowels will be measured and paid for in accordance with Specification E22 “Supplying and Placing Reinforcing Steel”.

E25. SELF CONSOLIDATING CONCRETE REPAIRS

DESCRIPTION

E25.1 General

E25.1.1 The Work covered under this item shall include all operations relating to refacing of the pier shafts, pier and abutment bearing seats, prestressed concrete girders, and all concrete surface repairs as shown on the Drawings and in the locations as directed by the Contract Administrator.

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 things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E25.2 References

E25.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Specification E15, Structural Removals

(b) Specification E23, Structural Concrete

(c) Specification E22, Supplying and Placing Reinforcing Steel

(d) Specification E24, Drilling and Placing Dowels

(e) ICRI Guideline No. 03732.

E25.3 Scope of Work

E25.3.1 The Work under this Specification shall include:

(a) All concrete removals related to refacing the pier shafts, pier and abutment bearing seats, prestressed concrete girders, and all other concrete surface repairs.

(b) Supplying and placing new concrete related to the refacing of the pier shafts, pier and abutment bearing seats, prestressed concrete girders, and all other concrete surface repairs.

(c) All concrete removals related to areas lying withing the limits of the proposed abutment and pier modifications.

(d) Preparation of existing concrete surface for abutment bearing pedestals;

(e) Supplying and placing concrete for abutment bearing pedestals.

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 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.

MATERIALS

E25.5 General

(a) Unless otherwise listed herein, materials shall be in accordance with Specification E23 “Structural Concrete”.

(b) Concrete.

E25.6 Concrete

(a) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1:

(i) Class of Exposure : C-1;

(ii) Compressive Strength @ 28 days = 35 MPa;

(iii) Maximum Aggregate Size = 10mm;

(iv) Air Content: Category 1 per Table 4 of latest CSA A23.1

(b) The concrete mix shall meet the latest edition CSA A23.1 Cl. 8.9.2 Low Shrinkage requirements.

(c) Concrete repair material for girder repairs shall be SikaCrete®-08 SCC or equivalent as approved by the Contract Administrator.

(d) The concrete mix shall have an electrical conductivity less than 50,000 ohm-cm.

(e) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.

(f) The workability of the concrete mix shall be consistent with the Contractor's placement operations.

(g) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.

(h) The temperature of all types of concrete shall be between fifteen degrees Celsius (15˚C) and twenty-five (25˚C) at discharge. Temperature requirements for concrete containing silica fume shall be between ten degrees Celsius (10˚C) and eighteen degrees Celsius (18˚C) at discharge unless otherwise approved by the Contract Administrator.

(i) Concrete materials susceptible to frost damage shall be protected from freezing.

(j) Concrete repair material shall be compatible with the concrete substrate and the Contractor's method of placement. The Contractor may choose to use a proprietary repair mortar subject to the approval of the Contract Administrator.

EQUIPMENT

E25.7 General

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

(b) Equipment shall be in accordance with Specification E23 "Structural Concrete".

CONSTRUCTION METHODS

E25.8 General

(a) The Contractor may consider form and pour, pressure grouting or low velocity spraying as application methods for girder end concrete repairs. Other methods shall be subject to the approval of the Contract Administrator.

(b) Where concrete repair areas lie within the limits of the proposed abutment and pier modifications, those areas shall be cast monolithically with the abutment or pier modification concrete.

(c) The Contractor shall not form or place concrete on any concrete repair area until approval has been granted by the Contract Administrator.

E25.9 Removal of Existing Concrete and Concrete Surface Preparation

(a) The Contract Administrator will mark out areas requiring concrete repair. The Contractor shall provide access to the Contract Administrator to survey all existing concrete elements to remain. Additional areas may be added as the Work proceeds.

(b) The resulting surface from concrete removals is to be roughened as per Specification E15 "Structural Removals".

(c) Concrete patches and repair areas shall be square or rectangular in shape with squared corners as per ICRI Guideline 310.R-2008.

(d) All areas requiring repair shall have their perimeters sawcut to a depth of 20 mm. The only exception to sawcutting will be in areas where there is no room for a concrete saw.

(e) Remove all concrete in the repair area to a minimum depth

(i) 25 mm beyond the exposed rebar;

(ii) 6 mm larger than the largest size aggregate in the repair material beyond the exposed rebar;

(iii) to the depth of delamination;

(iv) whichever is greater.

(v) For repairs required on the prestressed concrete girders, removals shall in no case come within 50mm of the location of any existing prestressing strands. Where strand location is in potential conflict with concrete removals, the precise location of the prestressing strands shall be located by the Contractor prior to concrete removals. No removals shall occur without prior approval by the Contract Administrator.

(f) In locations where anodes or post-installed rebar will be present, remove concrete to provide a minimum of 50 mm cover.

(g) Concrete removal may be undertaken by mechanical means with chipping hammers of appropriate size so as not to damage the substrate concrete as accepted by the Contract Administrator. Alternatively, hydrodemolition may be used.

(h) Unless otherwise noted, the concrete substrate shall be roughened and prepared in accordance with ICRI Guideline No. 03732, CSP4 (Light Scarification).

(i) Clean all resulting concrete and steel surfaces by grit-blasting. All unsound and stained concrete shall be fully removed. Exposed rebar shall be cleaned to a near- white condition.

(j) Concrete removal shall continue along the reinforcing steel until no further delamination, cracking, or significant rebar corrosion exists and the reinforcing steel is well bonded to the surrounding concrete as per ICRI R310.1R.

(k) Galvanic anodes shall be installed were concrete removal exposes existing corroded reinforcing steel as per Specification E26 “Discrete Galvanic Protection System”.

(l) If recommended by the mortar/grout manufacturer’s directions, pre-wet the patch surfaces for the duration recommended.

E25.10 Cleaning and Repair of Reinforcing Steel

(a) Clean exposed reinforcing steel of rust, mortar, epoxy coating, etc. to provide sufficient electrical connection and mechanical bond.

(b) If significant reduction in the cross section of the reinforcing steel has occurred, replace or install supplemental reinforcement as directed by the Contract Administrator.

(c) Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.

E25.11 Abutment Bearing Pedestals

(a) The Contractor shall remove existing abutment seat concrete in accordance with Section E25.9 of this Specification.

(b) Reinforcing steel for abutment bearing pedestals shall be supplied, installed and paid for in accordance with E22 “Supplying and Placing Reinforcing Steel” and Specification E24 “Drilling and Placing Dowels”.

E25.12 Form Work and Shoring

(a) Formwork and shoring shall be in accordance with Specification E23 “Structural Concrete”.

E25.13 Formliner

(a) Formliner shall be used on all exposed formed surfaces.

E25.14 Bonding New Concrete to Existing Concrete

(a) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates. This may be done by either the application of a suitable bonding agent or grout or by using a self-bonding mortar or concrete. The Contract Administrator will check all repaired areas for bond using a hammer “sounding” method after form removal. Place mortar or concrete by trowelling, pumping, spraying, or into forms ensuring that all entrapped air is removed.

(b) Should a bonding grout be used, it shall be applied immediately before concrete placement. It shall be thoroughly brushed onto the existing hardened concrete surface in a thin and even coating that will not puddle.

E25.15 Mixing and Placing Concrete

(a) Mixing and placing concrete shall be in accordance with Specification E23 “Structural Concrete”. Where proprietary repair mortars are used, they shall be prepared in accordance with the manufacturer’s instructions.

E25.16 General Curing

(a) Concrete Curing shall be in accordance with Specification E23 “Structural Concrete”. Where proprietary repair mortars are used, they shall be cured in accordance with the manufacturer’s instructions.

(b) Refer to Clauses Specification E23 “Structural Concrete” for cold weather and hot weather curing requirements, respectively.

E25.17 Form Removal

(a) Form Removal shall be in accordance with Specification E23 “Structural Concrete”.

E25.18 Patching of Formed Surfaces

(a) Patching of Formed Surfaces shall be in accordance with Specification E23 “Structural Concrete”.

E25.19 Cold Weather Concreting

(a) Cold Weather Concreting shall be in accordance with Specification E23 “Structural Concrete”.

E25.20 Hot Weather Concreting

(a) Hot Weather Concreting shall be in accordance with Specification E23 “Structural Concrete”.

E25.21 Monolithic Concrete Repairs

(a) Areas of concrete repair identified within the proposed limits of new structural concrete shall be cast monolithically with the structural concrete. Concrete shall be supplied, placed and paid for in accordance with Specification E23 “Structural Concrete””. Concrete removals and surface preparation shall be in accordance with this Specification.

E25.22 Quality Control and Assurance

E25.23 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.

E25.24 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.

MEASUREMENT AND PAYMENT

E25.25 General

(a) Self Consolidating Concrete Repairs will be measured on an area basis and will be 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 included in this Specification, as accepted and measured by the Contract Administrator.

E25.26 Items of Work:

(a) Self Consolidating Concrete Repairs:
  (i) Substructure
  (ii) Prestressed Concrete Girders
  (iii) Monolithic with Substructure Modifications
  (iv) Abutment Bearing Pedestals

E26. DISCRETE GALVANIC PROTECTION SYSTEM

DESCRIPTION

E26.1 General

(a) The Work under this section consists of designing, supplying, installing and energizing a zinc-based galvanic corrosion control system consisting primarily of embedded zinc anodes, including required electrical connections, materials, testing and ensuring continuity of the reinforcing steel to all elements as outlined on the Drawings.

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

(c) Galvanic anodes to be Galvashield® XP4 anodes or approved equal in accordance with B6 “Substitutes”.

E26.2 References

(a) ACI/ICRI 1999 Concrete Repair Manual

(b) ACI Guideline No. 222 – Corrosion of Metals in Concrete

(c) ACI 562-13 Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings

(d) ACI Repair Application Procedure (RAP) Bulletin 8 – Installation of Embedded Galvanic Anodes (2010)

(e) ICRI Guideline 310.1R-2008 Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion

(f) ASTM B418-12 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes

E26.3 Submittals

(a) Shop drawings showing typical galvanic corrosion control system installation details, such as distributed anode installation locations, type, and location of anode standoff spacers, reinforcing connections shall be prepared by the Contractor and submitted for approval prior to any field installations. The shop drawings shall clearly illustrate the layout of the anodes as applies to the abutments on this project, in both elevation and section views.

MATERIALS

E26.4 Embedded Galvanic Anodes

(a) Discrete galvanic units shall be alkali-activated zinc meant to be embedded into concrete repairs and for corrosion prevention only. Nominal dimensions shall be:

(i) For Galvashield® XP4 anodes: 130mm x 33mm x 35mm or as approved. The anodes shall be pre-manufactured with a nominal 160 grams of zinc respectively in compliance with ASTM B418 Type II cast around a pair of uncoated, non-galvanized steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14 or greater.

(b) The galvanic anodes shall be alkali-activated and shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACT 562-13. Anode units shall be supplied with integral unspliced wires for directly tying to the reinforcing steel. Embedded galvanic anodes shall be Galvashield® XP4 as shown on the Drawings, available from Vector Corrosion Technologies (www.vector-corrosion.com) USA (813) 830-7566, Canada (204) 489-9611 or approved equal.

(c) Application for approved equals shall be requested in writing two weeks before submission of project bids. Application for galvanic anode approved equals shall include verification of the following information:

(i) The zinc anode is alkali-activated with an alkaline cementitious shell with a pH of 14 or greater.

(ii) The galvanic anode shall contain no intentionally added constituents corrosive to reinforcing steel, e.g. chloride, bromide, etc.

(iii) The anode manufacturer shall provide documented test results from field installations showing that the anodes have achieved a minimum of 10 years in service.

(iv) The galvanic anode shall have been used in a minimum of ten projects of similar size and application.

(v) The galvanic anode units shall be supplied with solid zinc core (ASTM B418) cast around uncoated, non-galvanized, non-spliced steel tie wires for wrapping around the reinforcing steel and twisting to provide a durable steel to steel connection between the tie wire and the reinforcing steel.

(vi) The anode manufacturer shall provide third party product evaluation, such as from Concrete Innovations Appraisal Service, BBA, etc.

E26.5 Repair Materials

(a) Repair mortars, concrete, and bonding agents shall be portland cement-based materials with suitable electrical resistivity less than 50,000 ohm-cm. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Repair materials with significant polymer modification and/or silica fume content may have high resistivity. Insulating materials such as epoxy bonding agents shall not be used unless otherwise called for in the design.

E26.6 Storage

(a) Deliver, store, and handle all materials in accordance with manufacturer's instructions. Anode units shall be stored in dry conditions in the original unopened containers in a manner to avoid exposure to extremes of temperature and humidity.

EQUIPMENT

E26.7 General

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

CONSTRUCTION METHODS

E26.8 General

(a) The galvanic corrosion protection shall consist of the anodes as indicated on the Drawings. The anode units are connected to the reinforcing steel and encased in a concrete with a minimum of 50 mm of clear concrete cover over the anode units.

E26.9 Manufacturer Corrosion Technician

(a) The Contractor will enlist and pay for a technical representative employed by the galvanic anode manufacturer to provide training and on-site technical assistance during the initial installation of the galvanic anodes. The technical representative shall be a NACE-qualified corrosion technician (Cathodic Protection Technician–CP2 or higher).

(b) The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.

(c) The Contractor shall coordinate its work with the designated corrosion technician to allow for site support during project start-up and initial anode installation. The corrosion technician shall provide Contractor training and support for development of application procedures, verification of electrical continuity, and project documentation.

E26.10 Chloride Testing in Existing Concrete

(a) Following removal of the existing concrete deck, the Contractor shall provide access to the Contract Administrator to obtain Rapid Chloride (RC) Tests at various locations along the girder top flange

(b) The results from these test will be used to further refine the discrete galvanic protection system to be installed along the top flanges of the existing concrete girders

E26.11 Concrete Removal and Preparation

(a) Concrete in repair area shall be removed and prepared in accordance with Specification E25, "Self Consolidating Concrete Repairs".

(b) Depth or size of concrete removal shall be such that galvanic anodes can be placed within the repair cavity to permit the necessary concrete cover and sufficient clearance around anode.

E26.12 Cleaning and Repair of Reinforcing Steel

(a) Clean exposed reinforcing steel of rust, mortar, epoxy coating, etc. to provide sufficient electrical connection and mechanical bond.

(b) Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.

(c) Verify electrical continuity of all reinforcing steel, including supplemental steel, as per Section E26.13(g).

E26.13 Galvanic Anode Installation

(a) Remove and prepare deteriorated concrete in accordance with Section E25, Self Consolidating Concrete Repairs.

(b) Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.

(c) Anode spacing shall be such to provide full protection for the entire patch perimeter. Anode spacing is dependent on the reinforcing steel density. Maximum anode spacing shall be as per the manufacturer's guidelines to provide a 50 years service life. Anode spacing shall be subject to the approval of the Contract Administrator.

(d) Place the galvanic anodes as close as possible to the patch edge while still providing sufficient clearance between anodes and substrate to allow the repair material to fully encase the anode with a minimum concrete or mortar cover over the anode of 25mm. If necessary, increase the size of the repair cavity to accommodate the anodes.

(i) Place the anode such that the preformed BarFit™ groove fits along a single bar or at the intersection between two bars and secure to each clean bar.

(ii) If less than 25 mm of concrete cover is expected, place anode beneath the bar and secure to clean reinforcing steel.

(e) The tie wires shall be wrapped around the cleaned reinforcing steel at least one full turn in opposite directions and then twisted tight to create a secure electrical connection and allow no anode movement during concrete placement.

(f) Repair materials with resistivity greater than 50,000 ohm-cm are not to be used.

(g) Electrical Continuity

(i) Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm Ω) or DC potential (mV) with a multi-meter.

(ii) Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 Ω or less or the DC potential is 1 mV or less.

(iii) Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established by tying discontinuous steel to continuous steel using steel tie wire.

(iv) Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is 1 Ω or less or the potential is 1 mV or less.

(h) The discrete galvanic anodes will be connected to the existing, exposed reinforcement. Provide electrical continuity with new dowels embedded into existing concrete as per Manufacturer's guidelines to provide a 50-year design life. Proposed electrical connection details shall be approved by the anode manufacturer and shall be detailed on the shop drawing submittal. Anodes do not need to be connected to corrosion resistant reinforcement (e.g. stainless steel reinforcement).

E26.14 Concrete or Mortar Replacement

(a) If the repair procedures require the concrete surface to be saturated with water, do not damage the anode nor allow the anode units to be soaked for greater than 20 minutes.

(b) Complete the repair with the repair material, taking care not to damage, loosen or leave voids around the anode

E26.15 Galvanic Protection for Girder Top Flange

(a) The location and spacing of the galvanic anodes installed along the existing girder top flange in the proposed concrete deck shall be determined by the Contract Administrator following the results of the Rapid Chloride Testing.

MEASUREMENT AND PAYMENT

E26.16 General

(a) The supply and installation of Discrete Galvanic Protection System as shown on the Drawings will be measured on a unit basis and paid for at the Contract Unit Price per unit for the “Items of Work” as listed here 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 include in this Specification, accepted and measured by the Contract Administrator

E26.17 Items of Works

(a) Discrete Galvanic Anode
  (i) Substructure Repairs
  (ii) Girder Top Flange

E27. TEMPORARY JACKING AND SUPPORT OF SUPERSTRUCTURE

DESCRIPTION

E27.1 General

(a) This Specification shall cover all operations related to bridge superstructure jacking and supporting as specified herein and indicated on the Drawings.

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

E27.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
  (i) Section D19, Environmental Protection Plan
  (ii) Specification E15, Structural Removals
  (iii) Specification E28, Supply and Installation of Bearings
  (iv) Specification E13, Temporary Protection System

E27.3 Scope of Work

E27.3.1 The Work under this Specification shall involve:

(a) Temporary shoring and jacking shall be provided as required to undertake the bearing replacement and associated works at the abutments and piers and in accordance with the details shown on the Drawings.

(b) Raising the superstructure at the abutments and piers is intended to permit the Contractor to carry out the following works:
  (i) Removal of existing bearings;
  (ii) Bearing seat concrete repair;
  (iii) Installation of new bearings;

(c) Jacking points and allowable loads are provided on the Drawings. The Contractor will be responsible for the final choice and design of the shoring and jacking system that is acceptable to the Contract Administrator.

(d) Jacking from the existing girders adjacent to the existing bearings shall be permitted, provided that proposed jacking area is greater than or equal to the size of the existing bearings.

(e) Jacking of the superstructure shall include the design and installation of any temporary bearings that may be required to support the superstructure during construction.

E27.4 Submittals

(a) The Contractor shall submit to the Contract Administrator, at least fourteen (14) calendar days prior to commencement of any jacking and supporting operation, detailed drawings of the Contractor's proposed jacking and supporting system, equipment and procedures. The detailed plans shall be designed by, prepared by, and bear the seal of a Professional Engineer (Design Engineer), registered to practice in the Province of Manitoba. The detailed drawings shall include, but not be limited to:

(i) type, number and location of jacks and all other equipment and structures to be used for jacking;

(ii) details of standby jacking, and supporting equipment (including provisions for allowing normal expansion / contraction movements of the bridge superstructure);

(iii) jacking loads;

(iv) superstructure support details; and

(v) procedures and sequence of work for jacking up and supporting the bridge superstructure and transferring of load onto the bearing assemblies.

(b) The submission of the detailed drawings will in no way relieve the Contractor of the full responsibility for the design and proper operation of the jacking and supporting system. The Contractor's Design Engineer shall be responsible for visiting the site as often as is necessary to inspect the jacking and supporting equipment and procedures so as to ensure that the work is carried out in accordance with the Design Engineer's sealed detailed drawings. The Contractor shall provide the Contract Administrator with a letter bearing the seal of the Design Engineer, certifying after personal inspection of the work that the jacking and supporting is being carried out in accordance with the sealed detailed drawings.

MATERIALS

E27.5 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.

EQUIPMENT

E27.6 General

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

E27.7 Jacking System

(a) The jacking system shall be capable of jacking the superstructure simultaneously, uniformly and equally at each of the abutments and piers. The jacking system shall also be capable of releasing load, lowering the bridge superstructure and transferring load to the bearings simultaneously, uniformly and equally.

(b) The Contractor shall have adequate standby jacking and supporting equipment at the site prior to starting any jacking in order to ensure that bridge superstructure jacking and supporting is continuous, timely and achieved without interruption.

CONSTRUCTION METHODS

E27.8 Sequence of Work

E27.8.1 General

(a) A proposed bearing replacement sequence of work is shown on the Drawings for both abutment bearings and pier bearings.

(b) The Contractor is permitted to propose an alternative sequence of work to the Contract Administrator for review and acceptance.

(c) Jacking from the existing girders shall only occur after the concrete bridge deck has been removed from the existing girders.

(d) Jacking from the existing abutment and pier end diaphragms shall not be permitted once the bridge deck has been removed.

(e) Girder longitudinal bracing shall be installed in accordance with E23.6.10 prior to jacking and installation of temporary bearings.

(f) Jacking and temporary support of the superstructure shall be allowed on the girders adjacent to the existing bearings provided that the area of the jacking plates and/or temporary bearings are equal to or greater than the area of the existing bearings.

(g) Temporary bearings may be installed to support the superstructure during construction. Temporary bearings shall be designed to allow for thermal expansion and contraction of the girders during construction.

E27.9 Jacking and temporary supporting operations shall be undertaken in such a manner to prevent distortion and provide equal lift of the superstructure. The Contractor shall jack up and lower the superstructure simultaneously, uniformly and equally. Change in soffit elevation at any point along the jacking line shall not vary by more than +/- 2 mm from the average.

E27.10 Monitoring jack extension alone is not sufficient for maintaining elevation control – deflection of jack supports must also be accounted for.

E27.11 Jacks and supporting structures shall have a minimum safe working load at least one hundred and fifty percent (150%) of the expected jacking forces.

E27.12 The Contractor shall jack the bridge the minimum vertical dimension required to carry out the required repair, rehabilitation, and modification works.

E27.13 Jacking from any new concrete component, including but not limited to pier modification concrete, abutment bearing pedestals, and new girder diaphragms, shall not occur until the concrete has attained a minimum of 75% its design compressive strength, as approved by the Contract Administrator.

E27.14 The Contractor shall locate the jacking and supporting equipment such that it does not interfere with the required construction operations. After jacking, temporary bearings or blocking can be erected for support. Temporary bearings or blocking shall be erected immediately adjacent to each side of each jacking bearing plate. The total bearing area of temporary bearings or blocking per jacking point shall be, at minimum, equal to the area of the jacking bearing plate.

E27.15 Prior to jacking the Contractor shall establish and have in place a method of defining and measuring the elevation of the underside of the superstructure relative to a fixed point on the substructure unit immediately below. Monitoring points shall be provided under each girder.

E27.16 The Contractor shall be responsible for taking these measurements in the presence of the Contract Administrator. The following measurements shall be done to monitor the rate and amount of jacking and to establish the vertical location of the bridge superstructure at completion of all works.

(a) Prior to jacking;

(b) At completion of jacking;

(c) After jack release, lowering the bridge superstructure and transferring of load onto bearing assemblies.

E27.17 The Contractor's temporary supports shall be designed for and must be capable of allowing the normal expansion / contraction movements of the bridge superstructure to take place while they are being used.

E27.18 The shoring and jacking design shall include provision of lateral restraint to the superstructure.

E27.19 Sequence of Work

(a) After jacking the superstructure at the abutments and piers, perform all operations as per the Drawings.

QUALITY CONTROL AND ASSURANCE

E27.20 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.

E27.21 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.

MEASUREMENT AND PAYMENT

E27.22 Jacking and supporting of the bridge superstructure will not be measured. Jacking and supporting of the bridge superstructure will be paid for at the Contract Lump Sum Price for "Temporary Superstructure Jacking and Support System", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E28. SUPPLY AND INSTALLATION OF BEARINGS

DESCRIPTION

E28.1 General

(a) This Specification shall cover all operations related to:

(i) Design, fabrication, transportation, and installation of steel pot bridge bearings including anchor bolts and additional diaphragm plates with studs as specified herein and as shown on the Drawings.

(ii) Supply and installation of roof slab bearings, plates with studs, stainless steel plates, and neoprene pad system as shown on the Drawings.

(iii) 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.

E28.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) CAN/CSA S6-19 Canadian Highway Bridge Design Code

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

(iii) CAN/CSA G164 – Hot Dip Galvanizing of Irregularly Shaped Articles

(iv) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding)

(v) ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

(vi) ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

(vii) ASTM A193/A193M – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

(viii) ASTM F1554 - Grade 36 for Anchor Bolts, Nuts, and Washers

(ix) ASTM F3125 – Grade A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

(x) ASTM F3125M– Grade A325M Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).

(xi) ASTM D4894 – Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials.

(xii) SSPC-SP5 “White Metal Blast Cleaning”.

E28.3 Scope of Work

E28.3.1 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) Steel pot bearings;

(b) Sole plates, top plates, additional diaphragm plates, and masonry plates;

(c) Preformed fabric pads;

(d) All fasteners, bolts, and anchor bolts;

(e) Hot Dip Galvanizing of steel components;

(f) Neoprene bearing pads; and

(g) Stainless steel sliding plates

E28.4 Submittals

E28.4.1 The Contractor shall submit the following to the Contract Administrator, in accordance with the Specification:

(a) The Contractor shall submit to the Contract Administrator detailed Shop Drawings for the bearings and all associated plates and anchorages that are stamped, signed and

dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba in accordance with 0, Shop Drawings.

(b) The Contractor shall submit to the Contract Administrator documentation of all Quality Control testing undertaken for bearings as specified herein.

(c) The Contractor shall submit to the Contract Administrator the installation methods he intends to use to install the bearings for approval at least ten (10) days prior to starting any bearing installation. The installation procedure will be subject to review by the Contract Administrator and the bearing supplier.

(d) The Contractor shall submit to the Contract Administrator any proposed repair procedures for damaged coating areas for approval seven (7) days prior to proceeding with the repair.

MATERIALS

E28.5 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.

E28.6 Bearings

(a) Bearings and anchor bolts shall be fabricated from new materials. Bearings and anchor bolts shall be designed and fabricated in accordance with the latest edition of CSA S6-19 Canadian Highway Bridge Design Code and AASHTO M251 “Standard Specification for Plain and Laminated Elastomeric Bridge Bearings”.

(b) All steel shall be in accordance with the latest edition of CAN/CSA G40.21, Grade 300W, except for masonry and sole plates, which shall be Grade 350W. Stainless steel plates shall conform to the latest edition of ASTM Standard A167, Type 304.

(c) PTFE surface shall be made from pure virgin PTFE resin satisfying the requirements of the latest edition of ASTM D4894. PTFE shall be resistant to all acids, alkalis and petroleum products, stable at temperatures from -220°C to +260°C, non-flammable and non-absorbing of water.

(d) Elastomer shall be neoprene or natural rubber, AASHTO low temperature Grade 4 or 5 with a Shore A Hardness of 60 and a shear modulus (G) between 0.9 and 1.38 MPa.

(e) All exposed surfaces of the steel plates shall be galvanized. Galvanizing shall be to a handrail smooth finish with no holes allowed. Galvanizing shall be in accordance with CAN/CSA G164 and ASTM 123 and shall have a minimum net retention of 610 g/m2 or zinc metallized. The fabricator and galvanizer shall safeguard against embrittlement using recommended practices from applicable standards. Seal all welds prior to galvanizing. Surfaces to be galvanized shall be blast cleaned in accordance with SSPC-SP5, “White Metal Blast Cleaning”.

E28.7 Anchor Bolts

(a) Anchor bolts shall conform to ASTM F1554 Grade 36. Anchor bolts, nuts, and washers shall be hot-gipped galvanized in accordance with CAN/CSA G164 and ASTM 123 to a minimum net retention of 610 g/m2 unless otherwise noted on the drawings.

(b) Bearing fixing bolts shall be ASTM F3125 Grade A325/325M. Galvanized bolts shall be used when fixing galvanized or metallized plates.

E28.8 Preformed Fabric Pad

(a) Preformed fabric pad shall be reinforced and elastomeric, 6 mm thick, Fabreeka pad or approved equivalent in accordance with B6 “Substitutes”.

E28.9 Epoxy Adhesive

(a) Anchor bolts shall be placed with epoxy adhesive approved by the Contract Administrator.

E28.10 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.

E28.11 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) 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.

EQUIPMENT

E28.12 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E28.13 General

(a) Any structural steel components that in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

(b) Bearings shall be stored in a secure, clean facility.

E28.14 Design, Fabrication, and Supply

(a) The bearings details shown on the Plans are for illustration purposes only. The Contractor is responsible for the design, fabrication, and supply of the bearings in accordance with the details provided on the Drawings. Design of the bearings shall include design of anchorage into the substructure units and anchor assemblies cast into the proposed abutment and pier end diaphragm concrete.

(i) The bearing designer shall receive permission on all bearing dimensions prior to fabrication.

(ii) The bearing designer shall coordinate the location of anchor bolts with the reinforcement details for the bearing pedestals as provided on the Drawings.

(b) The overall dimensions of the bearings shall be within a tolerance of +/- 3mm in plan and height.

(c) The final thickness of the bearing plates noted as “Additional Diaphragm Plates”, as well as the design of the shear studs will need to be field verified prior to fabrication. The final plate thickness will be dependent on the existing bearing seat elevation and the final underside of girder and diaphragm elevation as determined by the Contractor and approved by the Contract Administrator.

(d) Bearings shall be clearly marked with their position on site and direction of installation. Markings shall be clearly visible on all bearings to prevent mix-up on site. Information

marked on the bearings must correspond with the information contained on the approved Shop Drawings for the bearings.

(e) Bearings shall be supplied with suitable handling devices as required. Temporary clamping devices shall be used to maintain the correct orientation of the parts during handling, transport, storage, and installation but are not to be used for slinging or suspending bearings unless specifically designed for this purpose.

(f) Bearings shall be protected during handling, transport, storage, and installation from damage, distortion, and all deleterious material and contaminants including moisture and dust.

(g) The bearing Supplier shall verify the condition of the bearings supplied to the work site.

E28.15 Installation

E28.15.1 Bearings

(a) Before erection of the bearings, the Contractor shall satisfy himself that the location of substructure units and elevations of bridge seats are in accordance with the Drawings and Specifications. All discrepancies discovered by the Contractor shall be brought immediately to the attention of the Contract Administrator.

(b) The Contractor shall accurately assemble and install the bearings as specified on the Drawings and as directed by the Contract Administrator.

(c) Temporary clamping devices shall be used to maintain the correct orientation of the parts during handling, transport, storage, and installation but are not to be used for slinging or suspending bearings unless specifically designed for this purpose.

(d) Bearings shall be protected during handling, transport, storage, and installation.

(i) The pot bearing assemblies shall be protected from damage, distortion, and excessive heat and shall be kept clean and free of all deleterious matter, contaminants, dirt, dust, and moisture during handling and installation.

(ii) Pot bearing assemblies that have been preassembled shall not be dismantled unless absolutely necessary for inspection or installation. Bearings shall not be opened or dismantled at the site except under the direct supervision of or with the approval of the Manufacturer.

(e) The Contractor shall verify the coding and condition of the bearings supplied to site.

(i) Any damage and/or miscoding shall be promptly reported to the Contract Administrator.

(ii) The Contractor shall install the pot bearings assemblies at the locations and in accordance with the details as shown on the Plans, the Shop Drawings, and the installation procedures.

(f) All existing concrete surfaces in contact with the new bearing assemblies shall be clean, sound metal, free of dirt, debris, rust, and all foreign matter. The tops of the existing substructure units may need to be levelled or otherwise prepared to evenly seat the proposed bearings.

(g) The Contractor shall ensure that the bearings are installed by qualified personnel.

(i) A representative from the bearing Manufacturer will be required to present on-site to supervise and inspect the bearing installation. The Contractor shall be responsible for arranging and covering all costs associated with the services of the representative from the bearing Manufacturer.

(h) Bearings shall be set at time of installation to the dimensions and offsets as shown on the Plans and final approved Shop Drawings and shall be adjusted as necessary to take into account the temperature and future movements of the bridge due to temperature. Clamping devices shall be removed after each bearing is in its final position with all permanent connections made and after all concrete and grout in contact with the bearing has been placed. Provision shall be made to keep the pot bearing assemblies in correct position during the placement of concrete and grout.

(i) Upon completion of the work, the top and bottom surfaces of the bearings shall be in full contact with the structure. Bearing assemblies shall be uniformly bedded over their entire area. Voids or hard spots after installation will not be acceptable.

(j) Field welding shall conform to the requirements of CSA W59.1.

(i) Prior to field welding, all coatings on the steel areas being welded shall be removed in the area of weld.

(ii) All field welds and areas of damaged coating shall be repaired with an approved zinc metalizing touch up material followed by application of the primer and aluminium-coloured polyethylene sealer original used to coat the pot bearing assemblies. The proposed zinc metalizing touch up material as well as the proposed procedure for repair of damaged coating areas shall be submitted by the Contractor to the Contract Administrator for review and comment.

(k) Tighten threaded fixings uniformly to avoid overstressing any part of the bearing. Supply vibration-resistant-type fasteners where significant vibration may occur.

(l) After installation, leave bearings and their surrounding areas clean.

(m) The Contractor shall ensure that the bearing assemblies are installed in such a manner that will not void the fabrication guarantee provided by the Manufacturer.

(n) Any bearings that in the opinion of the Contract Administrator have been damaged or otherwise rendered unusable by improper storage or handling by the Contractor shall be replaced by the Contractor at his expense.

E28.15.2 Anchor Bolts

(a) The Contractor shall note that the anchor bolts are essential to the structural adequacy of the bearings and care shall be taken not to damage them during construction.

(b) The Contractor will be required to core anchor bolt holes in the substructure concrete and epoxy the anchor bolts at each location as indicated by the shop drawings provided by the bearing supplier.

(c) Anchor bolts shall be set accurately and grouted with non-shrink cement grout accepted by the Contract Administrator. All methods and materials for setting anchors bolts and building bearing pads shall be submitted to the Contract Administrator for review and acceptance.

E28.15.3 Alignment and Tolerances

(a) The pot bearing assemblies shall be installed so that their longitudinal and transverse centrelines are within +/-3 mm of the position shown on the Plans. Threaded fixings shall be tightened uniformly to avoid overstressing any part of the bearing. Bearings and their surrounding areas shall be left clean after installation.

(b) The centreline of the bearings along the direction of movement shall be parallel to the direction of the movement of the bridge.

(c) Bearing assemblies shall be set to their correct inclination to the horizontal to the tolerance of 0.1°.

(d) Concrete surfaces in contact with the bearings shall not vary from a flat plane by more than 3mm in 500mm within the plan area of the bearing and local irregularities shall not exceed 1mm.

(e) The tolerance for the elevations at the top of the bearing assemblies shall be -0 mm / +2 mm.

E28.15.4 Adjustment of Bearings

(a) Adjustment to bearing location and bearing elevation shall be undertaken so as to achieve the lines and grades shown on the Drawings. The Contractor shall ensure that the structural steel is maintained in correct position and alignment until adjoining elements have been erected and completed.

(b) Bearings shall be set in accordance with the table details shown on the Plans. When compensations for temperature are required, they shall be based on a coefficient thermal expansion of concrete of 10 x 10-6 per degree Celsius.

(c) Bearings and girders shall not be considered as being fixed finally in position until approval of the installation is given by the Contract Administrator, at the completion of the erection of materials.

QUALITY CONTROL AND ASSURANCE

E28.16 Quality Control

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

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

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

(d) Quality control testing for the bearings shall be completed in accordance with the latest edition of CAN/CSA S6-19 Canadian Highway Bridge Design Code

(e) The Contractor shall be made aware that minor adjustments of the bearing locations may be required as directed by the Contract Administrator during girder installation to ensure the centerlines of the bearing stiffener, centerline of sole plate, and temperature corrections are satisfied as per the Plans. Any deviations from the Plans shall be submitted to the Contract Administrator for approval prior to proceeding.

E28.17 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.

E28.18 Guarantees

(a) Fabrication Guarantee

(i) Upon installation of the bearings the bearing Supplier shall inspect the bearings and certify in writing that the bearings have been properly installed. The Contractor shall provide a written guarantee that the bearings will perform satisfactorily within the design range of movement under the design loads for a period of five (5) years from the date of Substantial Performance. The supplier shall state that they have reviewed the installation procedures and find it in accordance with their recommendations. The supplier shall guarantee the replacement of the bearings at no cost to the City of Winnipeg in the event that the bearings do not perform satisfactorily within the design range of movement and under the design loads.

(b) Installation Guarantee

(i) The Contractor shall ensure that the bearings are installed in such a manner that will not void the fabrication guarantee.

(ii) The Contractor shall guarantee in writing, the performance of the bearings for a period of five (5) years from the date of issuance of Substantial Performance. Provided in the guarantee for the replacement of the bearings at no cost to the City of Winnipeg in the event that the bearings do not perform satisfactorily in the range of design movement and under the design loads.

MEASUREMENT AND PAYMENT

E28.19 General

E28.19.1 Supply and Installation of Bearings will be measured on a unit basis and paid for at the Contract Unit Price per unit for the “Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

E28.20 Items of Work:

(a) Supply and Installation of Bearings

(i) Expansion Bearings

(ii) Fixed Bearings

(iii) Roof Slab Bearings

E29. MISCELLANEOUS METAL

DESCRIPTION

E29.1 General

(a) 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.

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

E29.2 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 A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use;

(l) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes;

(m) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement;

(n) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use;

(o) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay);

(p) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code;

(q) AWS D1.1, Structural Welding Code – Steel;

E29.3 Scope of Work

(a) The Work under this Specification shall include:

(i) Supply and install cover plates for abutment wingwall voidform;

(ii) Supply and install associated bolts, anchors, nuts and washers.

(iii) Quality control of materials and fabrication.

(iv) Galvanizing of miscellaneous metal.

E29.4 Submittals

(a) The Contractor shall submit the following to the Contract Administrator:

(i) Copies of Mill Test Certificates showing chemical analysis and physical tests of all miscellaneous metal prior to commencement of fabrication. Miscellaneous metal without this certification will be rejected.

(ii) Certification of chemical analysis and physical tests for all materials;

(iii) A complete set of Shop Drawings prior to commencement of fabrication. The Contractor shall indicate on the Shop Drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the Drawings and Specifications. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings. In no case will the Contractor be relieved of responsibility for errors or omissions in the Shop Drawings.

(iv) Clearly indicate shop and erection details including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.

(v) Shop Drawings shall be drawn to the same system (Metric or Imperial) as the Contract Drawings.

(vi) Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.

MATERIALS

E29.5 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.

E29.6 General Requirements for Miscellaneous Metals

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

(b) Furnish to the Contract Administrator's Shop Inspector mill test reports, properly correlated to all steel sections to be used for steel construction under this Specification.

(c) Fabrication shall be carried out in the Fabricator's own plant, the use of subcontractors for all or portions of the fabrication will only be considered unless applied for in writing by the Fabricator and subsequently approved in writing by the Contract Administrator. The Fabricator shall be fully responsible for the quality of work and shall bear all additional costs related to work being carried out at the subcontractors plant such as additional quality inspections, shipment, etc.

(d) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of OSO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate. The mill test certificate shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the specified requirements. The stamp shall include the appropriate material specification number, testing date and the signature of an authorized officer of the Canadian laboratory.

E29.7 Miscellaneous Metals

(a) Structural steel for all components of the miscellaneous metals shall be in accordance with CSA standard G40.21M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to three hundredths of a percent (0 to 0.03%) or fifteen hundredths of twenty-two hundredths of a percent (0.15 to 0.22%) for monotubular shafts and arms, and to less than three tenths of a percent (0.3%) for all other steel components.

E29.8 Steel plates and threaded roads

(a) Shall be supplied and installed by the Contractor as shown on the Drawings.

E29.9 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.

E29.10 Shear Stud Connectors

(a) Shear stud connectors shall conform to the requirements of ASTM A108, Grades 1015, 1018 and 1020.

E29.11 Zinc

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

EQUIPMENT

E29.12 General

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

CONSTRUCTION METHODS

E29.13 Fabrication

E29.13.1 General

(a) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.

(b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.

(c) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.

(d) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

(e) Cutting shall be in accordance with AWS D1.1, D1.6 and CSA W59.

E29.13.2 Clean Material

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

E29.13.3 Finish

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

E29.13.4 Bending

(a) When bending is necessary in order to meet the requirements of the design, it shall be done with care and by methods subject to the approval of the Contract Administrator. The bend line shall be at right angles to the direction of rolling.

(b) 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.

E29.13.5 Welding

(a) Specifications

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

(b) Welding Operator Qualification

(i) Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work. Qualification shall have been issued within two (2) years of commencement of fabrication.

(c) 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.

E29.13.6 Welding Procedures, Specifications and Qualification

(a) 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.

(b) 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.

(c) The Contract Administrator may accept previous qualifications of the welding procedure.

E29.13.7 Welding Materials

(a) 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).

(b) 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.

(c) 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.

(d) 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.

(e) 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.

(f) 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

(g) (15) minutes at a temperature of four hundred and twenty-five degrees Celsius (425°C) + fifteen degrees Celsius (15°C) before being used.

(h) 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.

(i) 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.

(j) 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.

(k) 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.

E29.13.8 Preheat and Interpass Temperature

(a) The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1, D1.6 and CSA W59.

E29.13.9 Welding Processes

(a) 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.

E29.13.10 Distortion and Shrinkage Stresses

(a) 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.

E29.13.11 Tack Welding

(a) 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.

E29.13.12 Stud Shear Connectors

(a) 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.

E29.13.13 Hot-Dip Galvanizing

(a) Galvanizing, when called for on the Drawings, shall be done in accordance with ASTM A123 and CSA G164;

E29.13.14 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.

(a) Heavy deposits of oil and grease shall be removed with solvents prior to blasting or pickling to SSPC – SP 1.

E29.14 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.

E29.15 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.

QUALITY CONTROL AND ASSURANCE

E29.16 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.

E29.17 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.

MEASUREMENT AND PAYMENT

E29.18 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) Abutment Wingwall Plates

E30. FIBRE-REINFORCED POLYMER (FRP) STRENGTHENING

DESCRIPTION

E30.1 General

(a) This Specification shall cover all applications relating to the design, fabrication, supply and installation of Fibre-Reinforced Polymer (FRP) for strengthening the existing pre-stressed concrete girders

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

E30.2 References

E30.2.1 The latest edition and subsequent revisions of the following:

(a) ACI 440.13-24

(b) Canadian Highway Bridge Design Code, CSA S6:19

(c) Guide Specifications for Design of Bonded FRP Systems for Repair and Strengthening of Concrete Bridge Elements, 2nd Edition

E30.3 Scope of Work

E30.3.1 The Work under this Specification shall include:

(a) Design of FRP wrap and anchors;

(b) Supply and fabrication of all FRP components;

(c) Preparation of concrete substrate for FRP strengthening;

(d) Installation of FRP strengthening and anchors;

(e) FRP strengthening coating protection;

(f) Coating of exterior face of exterior girders for aesthetics.

E30.4 Submittals

E30.4.1 The Contractor shall submit the following to the Contract Administrator, in accordance with this Specification:

(a) The Contractor shall submit to the Contract Administrator detailed Shop Drawings for the FRP strengthening and all associated components that are stamped, signed and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba in accordance with 0, “

(b) **4.6 CPKC GATE**		
P123-25-4601	CPCK ACCESS GATE DETAILS	22” x 34”

(c) Shop Drawings”.

(d) The Contractor shall submit to the Contract Administrator documentation of all Quality Control testing undertaken for FRP strengthening as specified herein.

(e) The Contractor shall submit to the Contract Administrator the installation methods they intend to use to install the FRP strengthening for approval at least twenty (20) days prior to starting any FRP installation. The installation procedure will be subject to review by the Contract Administrator and the FRP supplier.

(f) The Contractor shall submit to the Contract Administrator any proposed repair procedures for damaged areas of FRP strengthening for approval seven (7) days prior to proceeding with the repair.

E30.5 Materials

E30.5.1 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.

E30.5.2 FRP Wrap

(a) FRP wrap shall be TYFO SHE-51A Glass Fiber System and TYFO SCH-41-2X Carbon Fiber System by Fyfe, or equivalent approved in accordance with B6 “Substitutes”.

E30.5.3 FRP Anchors

(a) FRP anchors shall be compatible with the FRP wrap and capable of developing the full strength of the FRP wrap.

E30.5.4 FRP Strengthening and Girder Coating

(a) It is required that the FRP system is coated with a suitable topcoat as protection against environmental damage including UV degradation.

(b) The coating product shall be compatible with the FRP system.

(c) The color of the coating shall be concrete grey chosen to match the City’s standard anti-graffiti paint, or equivalent approved in accordance with B6 “Substitutes”.

(i) Dulex, BX 9Y +35 ½, CX 3Y +31, FX 8 ¾

(d) The exterior faces of the exterior girders shall be coated with a suitable product to match the color of the final FRP coating color to present a uniform face.

E30.6 Equipment

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

E30.7 Construction Methods

E30.7.1 General

(a) Any materials that in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

E30.7.2 Design, Fabrication, and Supply

(a) The FRP strengthening details shown on the Drawings are for illustration purposes only. The Contractor is responsible for the design, supply, preparation, and installation of the FRP strengthening in accordance with the details provided on the Drawings. Design of the FRP strengthening shall include design of anchorage into the girder concrete.

(b) The overall width, orientation, spacing, and anchorage details of the FRP wrap and FRP anchors shall be designed by the Contractor.

E30.7.3 Sequence of Work

(a) FRP strengthening shall be performed prior to the placing of the new bridge deck concrete. Formwork for bridge deck construction is permitted on the bridge during FRP strengthening.

(b) The FRP strengthening shall be fully cured and approved prior to staring placing new bridge deck concrete.

E30.7.4 Installation

(a) The Contractor shall follow the manufacturer’s recommendations and procedures for installation of all FRP components.

(b) Before installation of the FRP wrap, the Contractor shall prepare the concrete substrate in accordance with the FRP suppliers specifications. This shall include, but is not limited to, cleaning, roughening, patching, grinding, or rounding sharp edges of existing concrete surfaces.

(c) The existing girder ends have been treated with a zinc arc activated spray.

(d) Prior to application of the epoxy, the temperature shall be a minimum of 3°C above the dew point temperature, or as approved by the FRP manufacturer.

E30.7.5 Exterior Girder Coating

(a) The exterior faces of the exterior bridge girders shall be coated their full length with the same coating product as the FRP strengthening area.

(b) Existing girder concrete shall be prepared in accordance with the manufacturer’s recommendations.

QUALITY CONTROL AND ASSURANCE

E30.8 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.

E30.9 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.

MEASUREMENT AND PAYMENT

E30.10 General

(a) Designing, supplying, and installation of FRP strengthening will not be measured. FRP strengthening will be paid for at the Contract Lump Sum Price for “FRP Strengthening”, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(b) Supplying, preparing, and coating the exterior girder exterior faces will not be measured. Girder Coating will be paid at the Contract Lump Sum Price for “Girder Coating”, 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.

E31. EXPANSION JOINTS

DESCRIPTION

E31.1 General

(a) This Specification shall cover the supply and installation of expansion joints and its components, traffic barrier mounting plates, cover plates, end plates, nuts and anchors, as shown on the Drawings and as specified herein.

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

E31.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) MTI Standards Construction Specification 1065(I) “Supply, Fabrication, and Installation of Expansion Joints”

(ii) ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

(iii) ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

(iv) ASTM D395 – Standard Test Methods for Rubber Property – Compression Set

(v) ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

(vi) ASTM D471 - Standard Test Method for Rubber Property – Effect of Liquids

(vii) ASTM D573 – Standard Test Method for Rubber – Deterioration in an Air Oven

(viii) ASTM D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

(ix) ASTM D1149 – Standard Test Method for Rubber Deterioration – Surface Ozone Cracking in a Chamber

(x) ASTM D1171 – Standard Test Method for Rubber Deterioration – Surface Ozone Cracking Outdoors (Triangular Specimens)

(xi) ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness

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

(xiii) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles

(xiv) CAN/CSA W59 – Welded Steel Construction (Metal Arc Welding)

E31.3 Scope of Work

(a) The Work under this Specification shall include:

(i) The design, fabrication, supply, and installation of elastomeric moulded rubber segmental expansion joints.

(ii) The design, fabrication, supply, and installation of galvanized steel expansion joint barrier cover plates and associated plates, angles, and other hardware.

E31.4 Submittals

(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.

(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 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.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least 10 Business Days prior to the commencement of fabrication, a complete set of Shop Drawings sealed, signed, and dated by a Professional Engineer registered or licensed to practice in the Province of Manitoba in accordance with 0 “

4.6 CPKC GATE		
P123-25-4601	CPCK ACCESS GATE DETAILS	22” x 34”

(d) Shop Drawings”. No fabrication shall commence until acceptance of the shop drawings from the Contract Administrator has been obtained. The Contractor shall indicate on the Shop Drawings the necessary material specifications for all materials to be used, fabrication details and proposed field splice details of the steel components. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the Shop Drawings.

(e) The Contractor shall submit to the Contract Administration for review and approval, at least 10 Business Days prior to commencement of fabrication, copies of Mill Test Certificates showing chemical analysis and physical tests of all steel. Steel without this certification will be rejected.

(f) The Contractor shall submit to the Contract Administration for review and approval, at least 10 Business Days prior to commencement of fabrication, copies of all Quality Control tests and material tests, including all chemical analysis and physical tests, for all materials, as specified in this Specification.

MATERIALS

E31.5 General

(a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

(b) 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.

E31.6 Epoxy Adhesive

(a) Epoxy adhesive shall be ST 431, Dural Duralbond, Copper Capbound E, Sikadur 32 Hi-bond, Concresive 1001 LPL, or equal as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

E31.7 Grout

(a) Grout shall be nonmetallic and nonshrink grout. Acceptable grouts are: Master Builders Set Nonshrink Grout, Sika Grout 212, Sternson M-Bed Standard Grout, CPD Nonhrink Grout, or equal as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

E31.8 Expansion Joints

(a) Expansion joints shall be elastomeric moulded rubber segmental expansion joints located the transition between the grade beam and structural slab at South and North Abutments, as shown on the Drawings.

(b) The elastomeric moulded rubber segmental expansion joints shall be Watson Bowman Wabo®Transflex 400-A Joint System, as specified in the Drawings, and supplied by Watson Bowman Acme Corp., or equal as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

(c) Expansion joints shall have fabricated steel cover plates and slider plates on the concrete barriers as shown on the Drawings.

(d) All fasteners and hardware of the molded rubber segmental bridge deck expansion joints shall be galvanized in accordance with ASTM A153/A153M to a minimum net retention of 610 g/m2.

(i) The zinc coating shall be adherent, continuous, and reasonably smooth. It shall be free from imperfections such as blisters; gritty or uncoated areas; acid, black spots, or dross particle adhering to the coating; or other imperfections inconsistent with good commercial galvanizing practice. Globules of zinc that will interfere with the intended use of the material will not be permitted. The colour of the galvanizing shall be consistent and continuous.

(ii) Galvanizing touch-up repair product shall be Galvalloy. Galvalloy shall be as supplied by Metalloy Products Company, P.O. Box #3093, Terminal Annex, Los Angeles, California. Locally, this is available from Welders Supplies Ltd., 25 McPhillips Street.

E31.9 Steel

(a) Steel supplied for the fabrication of the expansion joint barrier cover plates shall conform to CSA Standard CAN/CSA-G40.21, Grade 300W, or equal as accepted by the Contract Administrator in accordance with B6. They shall be galvanized after shop fabrication in accordance with CSA Standard CAN/CSA-G164 to a minimum net retention of 610 g/m^2.

E31.10 Anchor Studs

(a) Anchor studs shall conform to the requirements of ASTM Specification A108, Grade Designation 1020 and shall be galvanized.

E31.11 Post-Installed Anchors

(a) Post installed anchors for expansion joint shall be Hilti HAS Threaded Rod, or equivalent approved in accordance with B6 “Substitutes”.

E31.12 Welding

(a) Welding shall be of a low oxygen classification. Manual electrodes shall be E7016 or E7018. All welding shall be in accordance with CSA Standard W59.

E31.13 Elastomeric Molded Panels

(a) The elastomeric molded panels shall be comprised of a formed steel shape suspended in an elastomeric material. The profile-riding surface shall have imbedded wear plates to ensure skid resistance and shall be capable of accommodating traffic loads. Each elastomeric molded panel shall be supplied with integrated bolt hole cavities and tongue and groove end connections.

(b) The elastomer used to mold the panels shall be manufactured of a neoprene compound exhibiting the physical properties listed in Table E31.1 below.

Table E31.1: Physical Requirements

Property	Physical Requirements	Test Procedure
1.Tensile Strength	Minimum 1800 psi (12.4 MPa)	D-412-98A
2.Elongation at Break	Minimum 400%	D-412-98A
3.Hardness, Type A Durometer	40-50	D-2240-02
4. Compression Set, 22hrs@158°F (70°C), Method B (modified)	Maximum 20%	D-395-01
5. Oil Swell, ASTM #3 Oil, 70hrs at 212°F (100°C) Volume Change	120%	D-471-98
6. Ozone Resistance, 20% Strain, 100pphm in air 70 hrs@104°F (40°C) (wipe with toluene to remove surface contamination)	No Cracks	D1149-99
7. Low Temperature, brittleness (3min@-40°F)	Not Brittle	D-746-79 (1987)

E31.14 Steel Angle

(a) The steel angles imbedded in the molded neoprene panels are formed form ASTM A-36 steel.

E31.15 Bolt Cavity Sealant

(a) Bolt hole cavities shall be filled using a two-part polyurethane sealant that meets Federal Specification TT-S-00227E. The Contractor shall ensure that the anchor bolts are dry from moisture prior to placement of material.

E31.16 Edge Void Sealant

(a) Edge voids shall be filled with a one-part polysulfide base synthetic rubber sealant confirming to Federal Specification TT-S00230C Type II Non-Sag. The Contractor shall ensure that the anchor blocks are dry from moisture prior to placement of material.

E31.17 Bedding Compound

(a) Apply edge void sealant as a bedding material to the blockout base prior to placement of the elastomeric gland. Material shall be a one-part polysulfide base synthetic rubber sealant confirming to Federal Specification TT-S-00230C Type II Non-Sag.

E31.18 Epoxy Adhesive for Post-Installed Anchors

(a) Epoxy grout shall be Hilti HVU or equivalent as approved by the Contract Administrator in accordance with B6.

E31.19 Epoxy Adhesive for Metal Plates

(a) Epoxy adhesive shall be ST 431, Dural Duralbond, Copper Capbound E, Sikadur 32 Hi-bond, Concresive 1001 LPL, or equal as accepted by the Contract Administrator in accordance with B6.

E31.20 Epoxy Grout

(a) Grout shall be non-metallic, non-shrink grout of a type approved by the Contract Administrator.

E31.21 Grout

(a) Grout shall be nonmetallic and nonshrink grout. Acceptable grouts are: Master Builders Set Nonshrink Grout, Sika Grout 212, Sternson M-Bed Standard Grout, CPD Nonshrink Grout, or equal as accepted by the Contract Administrator in accordance with B6.

E31.22 Epoxy Adhesive Strip

(a) Epoxy adhesive strip shall be 50 mm wide Flex-Tred nonslip adhesive strip or equal as accepted by the Contract Administrator in accordance with B6.

E31.23 Miscellaneous Steel Items

(a) Rods, cover plates, brackets and washer plates, slider plates, and all other associated steel items shown on the Drawings shall be fabricated from steel conforming to CSA Standard CAN/CSA-G40.21, Grade 300W and shall be galvanized in accordance with CSA Standard CAN/CSA-G164 to a minimum net retention of 610 g/m^2.

EQUIPMENT

E31.24 General

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

CONSTRUCTION METHODS

E31.25 General

(a) The complete expansion joint shop fabrication and installation shall be done by or under the direct supervision of a trained factory representative, who shall be responsible for the joint installation procedure.

(b) The manufacturer shall have a minimum of ten (10) years of experience specializing in the design and manufacture of expansion control systems.

(c) Care shall be taken to ensure that all members are straight and flat and free from twists, bends, and distortions due to welding. The units shall be shop assembled and checked for matching of sliding surfaces, correct cross-fall, as well as accurate positioning and alignment of supporting brackets. The Contractor shall exercise care in the handling of all units to prevent twists, bends, and warping.

(d) Matching expansion joints shall be assembled and bolted together for shipping.

(e) Expansion joint assemblies shall be shop checked for fit and match marked.

(f) 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, and pickling prior to galvanizing. Heavy deposits or oil and grease shall be removed with solvents prior to blasting and pickling.

(g) In no case shall weldments be substituted for extrusion shapes.

(h) Any components that, in the opinion of the Contract Administrator have been damaged or otherwise rendered useless by the improper handling by the Contractor shall be replaced by the Contractor at his own expense.

E31.26 Design, Fabrication, and Supply

(a) Expansion joints shall be designed by the expansion joint supplier. Expansion joints shall be designed and fabricated in accordance with the requirements of AASHTO LRFD Bridge Design Specifications (9th Edition) and AASHTO LRFD Bridge Construction Specifications (4th Edition).

(b) Joints shall be designed to accommodate the anticipated thermal expansion / contraction requirements based on an 80°C temperature range plus a minimum additional 25 mm of expansion movement and 25 mm of contraction movement.

(c) Details for joints provided on the Plans indicate the anticipated spacing and location of joint elements used to detail conflicting elements (reinforcing bars, shear studs, etc.). Requested adjustments to these elements to accommodate the expansion joint design shall be submitted to the Contract Administrator for review and approval.

E31.27 Concrete Blockout for Elastomeric Moulded Rubber Segmental Expansion Joints Installation

(a) Concrete blockout shall be prepared in accordance with the expansion joint manufacturers recommendations. Any irregularities that may potentially cause issues with the seating of the expansion joint shall be remedied by the Contractor

E31.28 Installation

(a) The Contractor shall install expansion joints as shown on the Drawings and shall be responsible for the correct matching and seating of parts. The expansion joints shall be checked for accurate matching of sliding plates with the bridge deck expansion joints installed at the specified skews and crossfalls.

(b) The expansion joints shall in be installed in accordance with the manufacturer’s recommendations. The Contractor shall have a technical advisor from the manufacturer on-site to advise on the installation of the joints.

(c) The Contractor is required to provide support for the expansion plates during placement of concrete. The Contractor may propose alternate methods of support for approval to the Contract Administrator. All support systems shall not interfere with concrete finishing operations and shall be a minimum 150 mm away from the top surface of the concrete.

E31.29 Galvanizing Touch-up Prior to Placement of Concrete

(a) Any areas of damaged galvanizing and field welds are to receive field applied galvanizing.

(b) Surfaces to be reconditioned with paints containing zinc dust shall be clean, dry, and free of oil, grease, pre-existing paint, and corrosion by-products. The galvanized steel surface shall be cleaned to remove all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter by hand chipping, scraping, sanding, and wire brushing.

(c) Surface preparation shall extend into the undamaged galvanized coating to ensure that the smooth recondition coating can be affected. All prepared surfaces shall be inspected and approved by the Contract Administrator prior to application of any galvanizing spray.

(d) Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.

(e) The process is to be repeated as required to achieve a thickness comparable to original galvanizing.

E31.30 Placement of Concrete at Expansion Joints Barrier Cover Plates

(a) The assemblies shall be set in position such that they will remain true to line and elevation during and after concreting.

(b) Bleeder holes shall be drilled into the expansion joint edge angles and to the top of the cover plates. These holes shall be used during concrete placement to verify that concrete has filled in all spaces beneath the cover plates, allowing air to escape out of the bleeder holes. Care shall be taken during consolidation of concrete to ensure that there are no voids in the concrete and around the expansion joints. Following concreting operations, the Contract Administrator shall inspect these steel areas around bleeder holes by methods of sounding. All voids shall be filled with an approved non-shrink grout.

(c) Before concreting, the expansion joint opening shall be set to give the correct width for the mean concrete temperature of the deck. The width shall be obtained from the installation temperature table given on the accepted shop drawings.

(d) Immediately prior to placement of concrete at the expansion joints, all metal contact surfaces between the expansion joint and concrete shall be coated with epoxy adhesive.

(e) Epoxy grout shall be used to fill any bolt holes left after the removal of manufacturer's clamping channels.

E31.31 Watertight Verification of Joint Seal

(a) Prior to installing the barrier cover plates, the Contractor shall isolate the expansion joints and maintain a minimum of 75 mm of water over all areas of the seal for a period of not less than four (4) hours, with no leakage. This shall also include verification of leakage between the molded panels joints and the concrete blockout. Any and all leaks shall be corrected, using mechanical or other adjustment of the expansion joints to the satisfaction of the Contract Administrator. In no case shall caulk or other temporary devices or materials be used to seal leaks in the expansion joints. The Contract Administrator's decision in this regard shall be final.

(b) Prior to commencing the test, the Contractor shall remove all expansion joint forming materials and debris from the deck and from the substructure units below. The Contractor shall provide safe access, acceptable to the Engineer, for inspection of the expansion joints during testing.

QUALITY CONTROL AND QUALITY ASSURANCE

E31.32 Quality Control

(a) All workmanship and all materials furnished and supplied under this Specification are subject to the 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 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.

E31.33 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) The Contractor shall provide the Contract Administrator with all Quality Control Documentation for review prior to fabrication of any expansion joint component.

(c) The Contractor shall provide the Contract Administrator with a physical sample of the expansion joint for review prior to fabrication.

(d) 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.

(e) 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.

E31.34 Markings

(a) All molded panels shall be identified as to the manufacturer by means of a continuous permanent mould mark. The mould marks shall be registered with the Contract Administrator and shall be used on all molded panels produced by the respective manufacturer. The molded panels shall also be permanently marked, with the date of production and the batch/lot.

(b) The Contractor shall supply to the Contract Administrator a summary of the molded panels identifying the data of manufacture, the batch/lot, and the proposed installation location.

E31.35 Samples and Testing Procedures

(a) The Contractor shall supply sample material at no charge to the Owner for quality control testing purposes. As soon as the molded panels to be used for the joints have been manufactured, they shall be available to the Contract Administrator for sampling.

(b) Testing procedures will be in accordance with the latest revisions of the methods indicated on Table E31.1.

(c) Requirements shown in Table E31.1 reflect test results taken immediately following compound mixing. Results may vary and are not indicative of product performance if specimens are skived from finished, molded parts.

(d) All materials failing to meet the Specification requirements will be rejected.

(e) Lots rejected may be culled by the supplier and, upon satisfactory evidence of compliance with the Specifications, will be accepted.

E31.36 Guarantees

(a) Fabrication Warranty

(i) Before final acceptance of the expansion joints by the Engineer, the Contractor shall provide the Department with a written warranty from the expansion joint supplier 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 date of Substantial Performance, provided that the expansion joints have been properly installed, acceptable to the Contract Administrator. The Supplier shall state that they have observed the installation and found it to be in accordance with their recommended procedure. The Supplier shall warranty the replacement of the joints, including removal of the defective expansion joint assemblies and supply and installation of the replacement expansion joint, at no cost to the City of Winnipeg, in the event that the joint does not perform satisfactorily within the design range of movement and under the design loads for a period of five (5) years from the date of Substantial Performance.

(b) Installation Warranty

(i) The Contractor shall ensure that the expansion joints are installed in such a manner that will not void the fabrication warranty.

(ii) Similar to the expansion joint Supplier, and prior to final acceptance by the Contract Administrator, the Contractor shall warranty, in writing, the performance of the expansion joints for a period of five (5) years from the date of Substantial Performance. The Contractor shall provide in the warranty for the replacement of the expansion joints at no cost to the City of Winnipeg, including all direct and indirect costs in the event the expansion joints do not perform satisfactorily in the range of design movement and under the design loads for a period of five (5) years from the date of Total Performance.

MEASUREMENT AND PAYMENT

E31.37 General

(a) The Supply and Installation of Expansion Joints will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the "Supply and Install Expansion Joint", which price shall be payment in full for supplying all materials / equipment and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E32. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

DESCRIPTION

E32.1 General

(a) 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 pedestrian underpass roof as specified herein and as shown on the Drawings.

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

E32.2 References

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards:

(i) CAN/CGSB-27.9M – Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing;

(ii) CGSB-37-GP-50M – Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(iii) CGSB-37-GP-51M – Application of Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(iv) CGSB-37-GP-56M – Membrane, Bituminous, Prefabricated and Reinforced for Rooting.

E32.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the concrete to receive the waterproofing membrane;

(ii) Applying primer to the concrete;

(iii) Placing the asphalt waterproofing membrane on the concrete deck, structural slabs, and approach slabs;

(iv) Placing polyester fabric protection layers and protection board, as shown on the Drawings;

(v) Suppling and installing wick drains and associated end drainage at the interface of the bridge deck and bridge traffic barriers.

SUBMITTALS

E32.4 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.

(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 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.

MATERIALS

E32.5 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.

E32.6 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.

E32.7 Primer

(a) The entire concrete surface to be waterproofed shall receive a prime coat conforming to the requirements of damproofing / waterproofing primer CGSB37-GP-9Ma, 930-18

(BAKOR) or approved equivalent in accordance with in accordance with B6, 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.

E32.8 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 B6.

(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.

E32.9 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 B6, 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.

E32.10 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 B6.

(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 12 mm ± 6 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.

E32.11 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.

E32.12 Wick Drains

(a) Wick drains shall consist of composite polypropylene with a total thickness of 3.6 mm, supplied in widths of 100 mm.

(b) The puncture strength shall be a minimum of 0.45kN, measured in accordance with the requirements of the latest edition of ASTM D4833

(c) Wick Drain shall be one (1) of the approved products: American Wick Drain and distributed by Layfield and Nilex Inc under private labels Nilex NuDdrain MD7407 and Layfield Wick Drain Type 1, or an approved equal as accepted by the Contract Administrator in accordance with B6.

(d) The rubber membrane shall consist of butyl rubber with a total thickness of 1.2 mm.

(e) Rubber membrane shall be one (1) of the approved products: Elastoshet 6147, BP47 Elastomeric Reinforcement, BAKOR 990-25, or an approved equal as accepted by the Contract Administrator in accordance with B6.

EQUIPMENT

E32.13 General

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

CONSTRUCTION METHODS

E32.14 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.

E32.15 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.

E32.16 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 cleaned, roughened, and prepared in accordance with ICRI Guideline No. 03732, CSP3 (Light Shotblast). The concrete 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°C and 218°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.

E32.17 Installation of Wick Drains

(a) Wick drains shall be installed along the full length of the bridge deck and approach slab at the interface between the slab and traffic barrier.

(b) Wick drains shall be installed when the hot poured rubberized asphalt waterproofing membrane is still hot and tacky. Special attention shall be given to waterproofing and wick drain modifications at deck drain pipe locations.

(c) Tack coat shall not be applied to wick drains.

QUALITY CONTROL AND ASSURANCE

E32.18 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.

E32.19 Access

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

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

MEASUREMENT AND PAYMENT

E32.20 Hot-Poured Rubberized Asphalt Waterproofing

(a) Hot-poured rubberized asphalt waterproofing with protection board shall be measured on area basis and paid for at the Contract Unit Price per square meter for “Hot-Poured Rubberized Asphalt Waterproofing”, 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.

E33. ASPHALTIC CONCRETE PAVING ON BRIDGE

DESCRIPTION

E33.1 General

(a) 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, structural slabs, and approach slabs. The thickness of the overlay shall be as specified on the Drawings.

(b) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, 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.

E33.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) Specification E32, Hot-Poured Rubberized Asphalt Waterproofing

(ii) Specification E48, Asphalt Pavement

E33.3 Scope of Work

(a) The Work under this Specification shall include:

(i) Surface preparation of the bridge deck, structural slabs, and approach slabs;

(ii) Supplying and applying the tack coat;

(iii) Supplying, hauling, placing and compacting of asphaltic hot mix (overlay) on the bridge deck, structural slabs, and approach slabs, including all work at the joints;

(iv) The quality control (QC) testing of all materials.

E33.4 Submittals

(a) In addition to Specification E48, 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.

MATERIALS

E33.5 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.

E33.6 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 E48, Asphalt Pavement

(b) Asphalt shall be SP1 mix.

E33.7 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.

EQUIPMENT

E33.8 General

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

CONSTRUCTION METHODS

E33.9 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.

E33.10 Application of Tack Coat

(a) Tack coat shall be applied to the entire surface of the bridge deck, structural slabs, 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 bridge barriers 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.

E33.11 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, the use of manual spraying equipment suitable for applying the liquid bituminous material uniformly at the desired rate will be allowed.

E33.12 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.

E33.13 Placing Asphaltic Concrete Paving Mixture

(a) The Contractor shall spread the asphalt pavement mixture by means of two simultaneous self- propelled mechanical paver complete with screed (Echelon Paving). 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 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.

(e) 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.

(f) 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.

(g) The Contractor shall apply a tack coat between successive lifts as approved by the Contract Administrator.

(h) Asphalt shall be placed in lifts not less than 35mm and not greater than 55mm in thickness.

E33.14 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 without vibration. 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.

E33.15 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.

E33.16 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.

E33.17 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.

E33.18 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.

QUALITY CONTROL AND QUALITY ASSURANCE

E33.19 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 E48, Asphalt Pavement.

E33.20 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.

MEASUREMENT AND PAYMENT

E33.21 General

(a) Asphalt paving on the bridge deck, structural slabs, and approach slabs will be measured on a weight basis and paid for at the Contract Unit Price per tonne for “Asphalt Overlay on Bridge”, 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.

E34. PENETRATING CONCRETE SEALER

DESCRIPTION

E34.1 General

(a) This Specification shall cover all operations relating to the supply and installation of penetrating concrete sealer as specified here in and as shown on the Drawings

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

E34.2 References

E34.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Section D19, Environmental Protection Plan

(b) Specification E23, Structural Concrete

E34.3 Scope of Work

E34.3.1 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) An approved Type IC silicone sealer shall be applied to all exposed concrete surfaces of the piers and abutments.

(b) Cleaning and surface preparation for the application of concrete sealer to all exposed concrete of the piers and abutments. This shall include existing concrete that is not affected by the rehabilitation works.

E34.4 Submittals

(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.

(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 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.

MATERIALS

E34.5 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 new and within the recommended shelf-life, as approved by the Contract Administrator.

E34.6 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 accepted by the Contract Administrator at least five (5) 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 material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E34.7 Penetrating Concrete Sealer

(a) An approval Type IC silicone sealer is Sikagard SN100, PENTREAT 244-100 or equal as accepted by the Contract Administrator, in accordance with B6.

EQUIPMENT

E34.8 General

(a) All equipment shall be a type approved by the Contract Administrator and shall be kept in good working order.

E34.9 Construction Methods

E34.9.1 Type IC Sealer

(a) The sealer shall be applied in accordance with the Manufacturer's recommendations; however, the application rate shall be increase be 30% from that indicated on the approved Product Sheet.

(b) Before applying the sealer, new concrete shall be cured for at least 28 days.

(c) The concrete surface shall be cleaned of existing paint coatings, dry, and air blasted to remove all dust and accepted by the Contract Administrator prior to applying sealer.

(d) In order to ensure uniform and sufficient coverage rates the Contractor shall apply measured volumes of sealing compound to appropriately dimensioned areas of concrete surface, using a minimum of 2 coats.

(e) Asphalt concrete pavement surfaces shall be adequately protected from overspray and runoff during sealer application.

QUALITY CONTROL AND ASSURANCE

E34.10 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 hereto 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.

MEASUREMENT AND PAYMENT

E34.11 The supply and installation of concrete sealer will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Penetrating Concrete Sealer" 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.

E35. SUPPLY AND INSTALLATION OF BRIDGE ELECTRICAL

DESCRIPTION

E35.1 General

(a) This Specification shall cover all operations relating to the supply, fabrication, and installation of the electrical systems shown on the Drawings and as specified herein.

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

E35.2 References

E35.2.1 Update All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) Electrical Section E72 to E85

E35.3 Scope of Work

E35.3.1 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) Supply and installation of CSTE (Customer Service Termination Enclosures). This work shall include:

(i) Supply and installation of the fibreglass pad and grounding rods.

(ii) Supply and installation of all associated electrical components for the complete operation of the CSTE as noted on the Drawings.

(b) Supply and Installation of Underbridge Lighting. This work shall include:

(i) The supply and installation of underbridge lighting fixtures

(ii) The supply and installation of all conduits, junction boxes, conduit supports, electrical cables, expansion joints and all other components required for the operation of the underbridge lights including both surface mounted components and those components which are to be cast into new bridge concrete.

(iii) Supply and installation of buried conduit connecting the CSTE to the underbridge lighting components mounted on the bridge structure, including any demolition and repairs made to the existing concrete slope paving.

(c) Bridge Lighting. This work shall include

(i) Supply and installation of conduits cast in the concrete deck for Manitoba Hydro streetlights, terminating when the conduits exit the structure and become buried in the approach roadworks, and when the conduits exit the concrete at the intended bridge lighting locations.

(ii) Supply and installation of buried conduits, including surface mounted junction boxes, connecting to bridge conduit in the approach fill as noted in (i), and terminating at the junction box (exact location to be determined by Hydro). Contractor shall assume the junction box is located no further than 25 m beyond the structure exit point)

(iii) All coordination required with Manitoba Hydro for the connection of the bridge conduits to Manitoba Hydro buried conduit at the end(s) of the bridge(s).

(iv) All coordination required with Manitoba Hydro for the installation of the bridge street lighting luminaires, performed by others.

E35.4 Submittals

(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.

(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 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.

MATERIALS

E35.5 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.

EQUIPMENT

E35.6 General

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

CONSTRUCTION METHODS

E35.7 General

(a) Refer to Electrical sections of Part E – Specifications for Construction Methods.

(b) Scope of work for Supply and Installation of Bridge Electrical shall include all work items required for the complete installation and operation of the CSTE, all work items that are installed on the existing or new bridge elements, and all work items that are required to connect the CSTE to the bridge components.

MEASUREMENT AND PAYMENT

E35.8 General

(a) Supply and installation of electrical will not be measured. Supply and installation of electrical will be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(b) Items of Work:

Supply and Installation of Bridge Electrical:

(i) Supply and Installation of CSTE
(ii) Underbridge Lighting
(iii) Bridge Lighting

E36. REMOVE EXISTING OVERHEAD SIGN STRUCTURES

DESCRIPTION

E36.1 General

(a) This Specification shall cover all operations related to the removal and disposal of the existing overhead sign structure and salvaging the existing guide sign panels as shown on the Drawings and as specified herein.

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

E36.2 References

E36.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) CW 1130; clauses 3.6 and 3.7

(b) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets

(c) Specification E37, Traffic Management for Overhead Sign Support Structures Removal and Installation

E36.3 Scope of Work

E36.3.1 The Work under this Specification shall include the following items or as otherwise directed by the Contract Administrator:

(a) Removal and disposal of the following bridge-type sign structures:
(i) S-568, Lagimodiere Blvd N/B, Concordia Avenue Exit

(b) Removal and salvage of all existing guide sign panels

(c) Demolition of sign structure concrete foundations.

E36.4 Submittals

E36.4.1 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.

E36.4.2 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.

MATERIALS

E36.5 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.

EQUIPMENT

E36.5.1 General

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

CONSTRUCTION METHODS

E36.6 Remove Existing Overhead Sign Structures

(a) The Contractor shall never lift an overhead sign structure or member over traffic.

(b) The Contractor shall remove the existing sign support carefully without damaging the existing structure or adjacent property.

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

(d) Any damage to the structure or hardware that has not been identified prior to removal will be repaired or replaced by the City at the Contractor’s expense.

E36.7 Remove and Salvage Existing Guide Sign Panels

(a) The Contractor shall remove and salvage all existing guide sign panels as part of the removal of the existing bridge-type sign structure S-568.

(b) The salvaged component shall be delivered to the City of Winnipeg Traffic Services compound on Archibald Street. The Contractor shall coordinate with the Contract Administrator for delivery of salvaged materials.

E36.8 Demolition of Sign Structure Concrete Elements

(a) All sign structure concrete foundation piles identified in E36.3 are to be removed to 1.0m below grade or 0.5 m below the benched surface, whatever has a greater depth.

(b) All foundation voids shall be filled to grade with backfill, as approved by the Contract Administrator.

(c) All foundation voids shall be seeded to match surrounding landscaping, as approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E36.9 Remove and Salvage Existing Overhead Sign Structure

(a) Removal and disposal of existing overhead sign structures will be measured on a unit basis and paid for at the Contract Unit Price for “Remove and Dispose of Existing

Overhead Sign Structure". The number to be paid for will be the total number of structures removed, salvaged, delivered and unloaded in accordance with this Specification, accepted and measured by the Contract Administrator.

E37. TRAFFIC MANAGEMENT FOR OVERHEAD SIGN SUPPORT STRUCTURES REMOVAL AND INSTALLATION

DESCRIPTION

E37.1 General

E37.1.1 This Specification shall cover all operations relating to the traffic management for overhead sign support structures removal and installation.

E37.1.2 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.

E37.1.3 Further to clauses 3.6 and 3.7 of CW 1130-R3, the following shall apply for any overhead sign support structure works:

(a) multiple lane closures, meaning the simultaneous closure of more than one (1) lane, shall be permitted as described herein, for the removal and installation of overhead sign structures;

(b) multiple lane closures will not be permitted:

(i) 6:00 am to 8:00 pm Monday through Saturday, unless otherwise approved by the Contract Administrator.

(c) complete directional or full closures, for the purpose of installing the bridge-type steel overhead sign support structures shall be limited to a maximum of ten (10) minutes;

(d) the Contractor shall submit the Traffic Management Plan for review by the Contract Administrator 15 Working days prior to beginning Work on the removal or installation of the overhead sign structure. All Traffic Management Plans submitted by the Contractor shall be designed and sealed by a professional engineering registered in the province of Manitoba and has expertise in the production of drawings for the City of Winnipeg.

(e) pedestrian and ambulance/emergency vehicle access must be maintained at all times;

(f) flagperson(s) shall be used to affect temporary lane closures during the lifting of structures over open lanes. Flagperson(s) shall meet all applicable Manitoba Workplace Safety and Health regulations;

(g) all traffic control shall be implemented in accordance with the City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets.

E37.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) CW 1130; clauses 3.6 and 3.7

(ii) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets

E37.3 Scope of Work

(a) The Work under this Specification shall include the traffic management for overhead sign structure removal and installation.

E37.4 Submittals

(a) The Contractor shall submit detailed traffic management plans for each overhead sign structure location for review a minimum of fourteen (15) Working Days prior to implementing the lane closure(s) or performing any work.

(b) The detailed traffic management plans shall be prepared in accordance with the current edition of the City of Winnipeg's Manual of Temporary Traffic Control on City Streets.

(c) The detailed traffic management plans shall:

(i) show a plan view of the area for each stage of construction or traffic control setup;

(ii) show all applicable signage and traffic management devices to be used;

(iii) provide all relevant dimensions and geometric layout of devices such as sign spacing, taper lengths, cone spacing, etc.;

(iv) indicate the general sequence of device installation;

(v) indicate the date and time of implementation of the devices;

(vi) indicate the expected date and time of the removal of the devices;

(vii) confirm the work zones created by the closures are adequate for the operation of cranes, and other construction operations required for the work; and

(viii) all other information as deemed necessary by the Contract Administrator and/or other agencies reviewing the submitted traffic management plans.

MATERIALS

E37.5 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.

EQUIPMENT

E37.6 General

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

MEASUREMENT AND PAYMENT

E37.7 General

(a) No measurement or payment will be made for the work described in this Specification. Traffic Management for Overhead Sign Support Structure Installation shall be incidental to the works.

E38. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS FOR STEEL OVERHEAD SIGN SUPPORT STRUCTURES

DESCRIPTION

E38.1 General

(a) This Specification shall cover all operations relating to the drilling, reinforcing, and pouring of concrete pile foundations for steel overhead sign structures.

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

E38.2 References

E38.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets

(b) CSA A23.1 – Concrete Materials and Methods of Concrete Construction

E38.3 Scope of Work

(a) The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations for new steel overhead sign support structures in accordance with this Specification and as shown on the Drawings.

E38.4 Submittals

(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.

(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 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.

MATERIALS

E38.5 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.

E38.6 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. Storage of materials shall be in accordance with CSA Standard A23.1.

E38.7 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.

E38.8 Patching Mortar

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

E38.9 Cement

(a) Cement shall be Type HS, HSe or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of the latest CSA Standard A23.1.

E38.10 Concrete

(a) General

(i) Concrete repair material shall be compatible with the concrete substrate.

(b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this Specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with the latest CSA A23.1:

(i) Class of Exposure: S-1 and F-1;

(ii) Compressive Strength @ 56 days = 35 MPa;

(iii) Water / Cementing Materials Ratio = 0.4;

(iv) Air Content: Category 1 per Table 4 of CSA A23.1-14 (5-8%);

(v) Cement – shall be as specified E38.9.

(c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.

(d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for pile foundations

(e) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.

(f) The temperature of all types of concrete shall be between fifteen degrees Celsius (15˚C) and twenty-five degrees Celsius (25˚C) at discharge. Temperature requirements for concrete containing silica fume shall be between ten degrees Celsius (10˚C) and eighteen degrees Celsius (18˚C) at discharge unless otherwise approved by the Contract Administrator

(g) Concrete materials susceptible to frost damage shall be protected from freezing.

E38.11 Aggregate

(a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with the latest CSA A23.1.

(b) Coarse Aggregate

(i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with the latest CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in the latest CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".

(ii) 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; and shall have an absorption not exceeding two and a quarter percent (2.25%).

(iii) 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, and excess of thin particles or any other extraneous material.

(iv) Coarse aggregate when tested for abrasion in accordance with the latest ASTM C131 shall not have a loss greater than thirty percent (30%).

(v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in the latest CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

(c) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of the latest CSA A23.1, Table 10, Gradation FA1.

(ii) 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.

(iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in the latest CSA A23.1, Table 12.

E38.12 Cementing Materials

(a) Cementing materials shall conform to the requirements of the latest CSA A3001.

E38.13 Silica Fume

(a) Should the Contractor choose to include silica fume in the concrete mix design, it shall not exceed eight percent (8%) by mass of cement.

E38.14 Fly Ash

(a) Fly ash shall be Type C1 or Type F and shall not exceed twenty-five percent (25%) by mass of cement.

(b) 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 formation of lumps shall not be used in the Work.

E38.15 Admixtures

(a) Air entraining admixtures shall conform to the requirements of the latest ASTM C260.

(b) Chemical admixtures shall conform to the requirements of the latest 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.

(d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.

(e) An aminocarboxylate based migrating corrosion inhibitor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject to the approval of the Contract Administrator.

E38.16 Water

(a) Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

E38.17 Concrete Supply

(a) Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of the latest CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.

(b) Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within (ninety) 90 minutes after the introduction of the mixing water to the cementing materials and aggregates.

(c) The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E38.18 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 the latest CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars. All bars, including ties, shall be hot-dip galvanized in accordance with the latest ASTM A767 for a minimum net retention of 610 g/m^2. Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E38.19 Anchor Bolts, Nuts, and Washers

(a) Anchor bolts, nuts, and washers shall be in accordance with the latest ASTM F1554 (Grade 55), and shall be hot-dip galvanized full length in accordance with the latest ASTM F2329 for a minimum net retention of 610 g/m^2, for the entire length of the anchor bolts. The top threaded portion of the anchor bolts shall be 300 mm long and the bottom threaded portion of the anchor bolts shall be 100 mm long. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E38.20 Anchor Bolt Templates

(a) Anchor bolt templates shall be the latest CSA G40.21 Grade 300W, minimum 10 mm thick, and will be incidental to construction of new concrete pile foundation and no separate payment will be made.

E38.21 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with B6.

E38.22 Precompressed Foam Joint Filler

(a) Precompressed foam joint filler shall be ”Emseal BEJS System”, satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B6.

(b) The sealant system shall be comprised of three components:

(i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated and highway-grade, fuel resistant silicone;

(ii) Field-applied epoxy adhesive primer; and

(iii) Field-injected silicone sealant bands.

(c) Impregnation agent shall have proven non-migratory characteristics. Silicone coating shall 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. The depth of seal shall be as recommended by the Manufacturer.

(d) 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” (12mm) down from the substrate surface.

(e) Material shall be capable, as a dual deal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plan and direction shall be executed using factory fabricated transition assemblies. Transitions shall be watertight at the inside and outside corners through the full movement capabilities of the product.

(f) All substitute candidates shall be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be:

(i) Capable of withstanding 65°C for three (3) hours while compressed down to the minimum movement capability (-50% nominal material size) without evidence of any bleeding of impregnation medium from the materials; and

(ii) Capable of self-expanding to the maximum movement capability (+50% nominal material size) with twenty-four (24) hours at 20°C.

MISCELLANEOUS MATERIALS

E38.23 General

(a) Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

EQUIPMENT

E38.24 General

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

CONSTRUCTION METHODS

E38.25 Location and Alignment of Piles

(a) Pile construction shall not commence until the Contractor has obtained clearance from the appropriate Utility Authorities including but not limited to Manitoba Hydro, MTS and City of Winnipeg Water and Waste.

(b) Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.

(c) The deviation of the axis of any finished pile shall not differ by more than one percent (1%) from the vertical.

E38.26 Buried Utilities

(a) The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.

(b) The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.

(c) The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

E38.27 Excavation

(a) Pile excavation shall be achieved by auguring (i.e. drilling) or hydro-jet excavation for the full depth of all piles unless noted otherwise on the Drawings.

(b) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough “slack” in conduits to move them slightly to avoid interference with the pile locations. The Contract Administrator may elect to alter the location of a pile if hydro-jet excavation shows that utilities cannot be avoided.

(c) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.

(d) All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.

(e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.

(f) If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole excavated as near as possible to the location shown on the Drawings. In locations where underground utilities have been exposed, the underground utilities shall be covered with clean sand to 300 mm minimum cover around the utility. Payment will not be made for condemned piles.

E38.28 Sleeving

(a) Steel or corrugated metal pipe sleeving shall be used if required to temporarily line the excavation to prevent bulging or caving of the walls.

(b) The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

(c) The sleeving shall be withdrawn as the concrete is placed in the excavation. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.

(d) The clearance between the face of the excavation and the sleeving shall not exceed 75 mm.

(e) The sleeving may remain cast in place if required to protect nearby utilities at the direction of the Contract Administrator. The top of sleeving shall be 300 mm below the top of finished grade.

E38.29 Inspection of Excavations

(a) Concrete shall not be placed in an excavation until the excavation has been inspected and approved by the Contract Administrator.

(b) The Contractor shall have available suitable light for the inspection of each excavation throughout its entire length.

(c) Any improperly set sleeving or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E38.30 Placing Reinforcing Steel

(a) Reinforcement shall be:

(i) placed in accordance with the details shown on the Drawings;

(ii) rigidly fastened together;

(iii) lowered into the excavation intact before concrete is placed.

(b) Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E38.31 Placing Anchor Bolts

(a) The anchor bolts shall be aligned with the steel templates matching the bolt holes in the sign structure base plate. The setting templates shall be held in place by the top and bottom nuts of the anchor bolts. The anchor bolts shall be plumb. Extreme care shall be used in this operation. Placement of anchor bolts without the steel template will not be permitted.

(b) The threaded portion of the anchor bolts projecting above the top surface of pile shall be coated with oil, before the concrete is poured, to minimize the fouling of threads splattered by concrete residue.

E38.32 Forms

(a) For hydro-jet excavated piles, the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 mm below final grade.

(b) For bored piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 mm below final grade.

(c) In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform. The minimum depth of the tubular forms (Sonotube) shall be as specified by E38.32(a) and E38.32(b).

(d) The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.

E38.33 Placing Concrete

(a) Care shall be taken to ensure that anchor bolts are vertically aligned and that anchor bolts and conduits are properly positioned prior to placement of concrete.

(b) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile.

(c) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be finished smooth with a hand float and provided with a one percent (1%) slope for drainage away from the centreline of the pile.

(d) The shaft 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. In the event that tremie concrete is allowed by the Contract Administrator, the concrete shall be placed as specified herein.

(e) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations 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 that may cause honeycombing, pitting, or planes of weakness.

E38.34 Tremie Concrete

(a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

(b) Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the excavation and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry excavation

E38.35 Protection of Newly Placed Concrete

(a) Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E38.36 Curing Concrete

(a) The top of the freshly finished concrete piles shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above ten degrees Celsius (10ºC) for at least seven (7) consecutive days thereafter.

(b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

(c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.

(d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed three degrees Celsius (3º C) in one (1) hour or twenty degrees Celsius (20ºC) in twenty-four (24) hours.

E38.37 Form Removal

(a) Forms shall not be removed for a period of at least twenty-four (24) hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

(b) The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

(c) Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E38.38 Patching of Formed Surfaces

(a) Immediately after forms around top of pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed.

(b) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

(c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be well- brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one (1) hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E38.39 Cold Weather Concreting

(a) Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above ten degrees Celsius (10ºC) for a minimum of three (3) days or till the concrete has reached a minimum compressive strength of 20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at their own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.

E38.40 Removal and Restoration of Adjacent Surface Treatments

(a) If the new pile being constructed is located in a concrete sidewalk/median slab, the existing slab shall be removed to the nearest existing joints. If the nearest existing joint is more than 600 mm beyond the perimeter of the pile, the Contractor shall remove a square section of the existing slab that is 300 mm beyond the pile perimeter. The surface of the slab shall be saw-cut to a depth of 50 mm around the perimeter of the square section. Care shall be taken to ensure that the saw-cut edge of the section is not chipped or broken during the removal of the concrete. Concrete slabs damaged beyond the specified limits shall be replaced at the Contractor's cost to the satisfaction of the Contract Administrator. After the pile has been constructed, the concrete sidewalk/median slab shall be restored flush with the adjacent surface level.

(b) If the pile being constructed is located in grass boulevard/median, following pile construction disturbed areas shall be backfilled and restored with sod around the new pile as directed by the Contract Administrator.

(c) If the pile being constructed is located in a paving stone surface, the paving stones shall be temporarily removed to the extent required for new pile construction and appropriately stored by the Contractor. Following pile construction, the Contractor shall cut as required and re-set the salvaged paving stones around the new pile flush with the adjacent surface level, as directed by the Contract Administrator.

(d) The removal and restoration of surface treatments will be considered incidental to pile construction works at each Site and no separate payment will be made.

QUALITY CONTROL AND ASSURANCE

E38.41 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 approval 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) 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.

(d) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E38.42 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.

MEASUREMENT AND PAYMENT

E38.43 Construction of New Cast-in-Place Concrete Pile Foundations

(a) Construction of new cast-in-place concrete pile foundations including supply and installation of anchor bolts complete with nuts, washers and steel templates will be measured on a unit basis and paid for at the Contract Unit Price per unit for the “Items of Work" listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator.

(b) Items of Work:

Cast-in-Place Concrete Pile Foundations:

(i) S568 - 915 mm Diameter Pile;

(c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and the Drawings shall be considered incidental to "Cast-in-Place Concrete Pile Foundations", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E39. SUPPLY AND INSTALLATION OF NEW STEEL OVERHEAD SIGN SUPPORT STRUCTURES

DESCRIPTION

E39.1 General

(a) The Work covered under this item shall include all operations related to the supply, fabrication, delivery, erection of new steel overhead sign support structures and installation of all sign panels onto the sign support structures.

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

E39.2 References

E39.2.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) City of Winnipeg's latest edition of the Manual of Temporary Traffic Control on City Streets

(b) Specification E37, Traffic Management for Overhead Sign Support Structures Removal and Installation

(c) Specification E40, Supply and Installation of Reflective Guide Sign Panels

E39.3 Scope of Work

E39.3.1 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) The supply and installation of steel overhead sign support structure S568 - Lagimodiere Blvd N/B, Concordia Avenue Exit, including installation of sign panels.

E39.4 Submittals

E39.4.1 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.

E39.4.2 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.

MATERIALS

E39.5 General

(a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

(b) All materials used for fabrication of overhead sign support structures shall be new, previously unused material.

E39.6 Handling and Storage of Materials

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

E39.7 Structural Steel

(a) Structural steel for all components of the overhead sign support structures shall be in accordance with CSA Standard G40.21 M, to the grades indicated on the Drawings. For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled within zero to three hundredths of a percent (0 to 0.03%) or fifteen hundredths to 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.

(b) The Contractor is advised that copies of mill test certificates showing the chemical and physical properties of all structural steel to be supplied under this Specification must be supplied to the Contract Administrator and be found acceptable prior to commencement of fabrication.

(c) Steel shall not be acceptable unless the mill test certificate states the grade to be as indicated on the Drawings. Lower grade steel shall not be acceptable (despite favourable published mill test results). Items fabricated without steel certification shall be rejected.

E39.8 Flange Bolts, Nuts, and Washers

(a) Flange bolts, nuts, and washers shall be in accordance with ASTM F3125 Grade A325, Type 1, hot-dip galvanized in accordance with ASTM F2329.

E39.9 Mounting Bracket Fasteners (Bracket-to-Bracket)

(a) Mounting bracket fasteners (connecting two (2) clamp brackets) shall be all-thread rod conforming to one (1) of the following:

(i) SAE Grade 2 hot dip galvanized;

(ii) ASTM A307 Grade B hot dip galvanized;

(iii) ASTM F1554 Grade 55 hot dip galvanized.

(b) Hot-dip galvanizing shall be in accordance with ASTM F2329. Plated coatings will not be accepted.

(c) Two (2) nuts, two (2) washers and one (1) lock washer (all hot dip galvanized) shall be provided for each segment of threaded rod.

(d) The Contractor is permitted to field cut the threaded rod to suit the required length. If so, apply Zinga zinc rich galvanizing touch up paint to cut ends.

E39.10 Mounting Bracket Fasteners (Bracket to Panel)

(a) Mounting bracket fasteners connecting the bracket to the aluminum backing bars of the sign panel shall be stainless steel all-thread hex bolts conforming to ASTM F593 Grade 304 or 316.

(b) One (1) nut, one (1) washer, and one (1) lock washer shall be furnished with each bolt.

E39.11 Fasteners for Handhole Covers

(a) Fasteners for handhole covers shall be in accordance with ASTM A276 Type 316 stainless steel.

E39.12 Hot-Dip Galvanizing

(a) Hot-dip galvanizing of structural steel shall be in accordance with ASTM A123 for a minimum net retention of 610 g/m^2.

E39.13 Galvanizing Touch-up and Field-Applied Galvanizing

(a) Only approved products listed below shall be used for field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds.

(b) Approved products for self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-09(2015) for "Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings" are as follows:

(i) Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California, available from Welder Supplies Limited, 150 McPhillips Street, Winnipeg;

(ii) Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161, York Road, Kings Mountain, North Carolina, available from Welder Supplies Limited, 150 McPhillips Street, Winnipeg.

E39.14 Cold Applied Galvanizing Compound

(a) Approved cold-applied galvanizing compound is as follows:

(i) ZINGA, as manufactured by ZINGAMETALL, Ghent, Belgium, available from Pacific Evergreen Industries Ltd. Vancouver, BC, Ph. (604) 926-5564, and Centennial Mine & Industrial Supply, Saskatoon, Sask., Ph. (306) 975-1944.

E39.15 Rodent Screen

(a) Rodent screens shall be ½" – 18F stainless steel (316L) expanded metal sheet or approved equal in accordance with B6.

E39.16 Aluminum T-Bars

(a) Aluminum T-Bars shall be in accordance with ASTM B221 6061-T6.

E39.17 Sign Plates and Panels for Overhead Sign Structures

(a) For sign structures S568, sign panels are to be supplied by the Contractor in accordance with E40 and installed on the overhead sign structures in accordance with this Specification.

E39.18 Welding Consumables

(a) Welding consumables for all processes shall be certified by the manufacturer to be complying with the requirements of CSA Standard W59 and the following Specifications:

(i) manual shielded metal arc welding (SMAW): All electrodes shall be basic-type electrodes conforming to CSA W48, classification E480XX, or imperial equivalent;

(ii) gas metal arc welding (GMAW): All electrodes shall conform to CSA W48, classification ER480S-X, or imperial equivalent;

(iii) flux cored arc welding (FCAW): All electrodes shall conform to CSA W48, classification E480XT-X or imperial equivalent. Electrodes shall be controlled by hydrogen (CH) designation;

(iv) submerged arc welding (SAW): All electrodes shall conform to CSA W48, classification F480X-EXXX or imperial equivalent;

(v) shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of negative forty-six degrees Celsius (-46ºC);

(vi) all electrodes, wires, and fluxes used shall be of a classification requiring a minimum impact of 27 joules at minus eighteen degrees Celsius(-18ºC).

(b) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for their approval at least two (2) Calendar Days prior to the scheduled commencement of any fabrication.

MISCELLANEOUS MATERIALS

E39.19 General

(a) Miscellaneous material incidental to this Work shall be as approved by the Contract Administrator.

EQUIPMENT

E39.20 General

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

CONSTRUCTION METHODS

E39.21 General Requirements

(a) Holes in the base plates shall be sized as shown on the Drawings, and provisions made for field erection must be accurate within plus or minus 13 mm between supports, without affecting final installation and load capacity.

(b) The base plates for the sign support structures shall be constructed to be fully compatible and mountable on the anchor bolts, provided in the foundations by the Contractor.

(c) Sufficient reinforced handholes and wiring holes shall be provided for lighting of the signs as shown on the Drawings. All wiring holes shall have threaded couplings. All unused coupling holes shall be capped with a threaded galvanized plug.

(d) The sign support structure shall be so fabricated that erection can be achieved by means of bolted connections.

(e) Each sign structure shall be provided with a "raised" structure identification number with a welding electrode in accordance with the details shown on the Drawings. The sign structure identification number shall be placed before hot-dip galvanizing.

(f) Adequate venting and drainage holes shall be provided in enclosed sections for hot- dip galvanizing. The galvanizing facilities shall be consulted regarding the size and location of these holes.

(g) Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing the sign structures.

E39.22 Fabrication

(a) All fabrication shall be carried out in accordance with this Specification and the Contract Drawings, as well as AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals - 2015 – 1st Edition, plus all subsequent revisions.

(b) The punching of identification marks on the members will not be allowed, except for the structure identification number.

(c) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may approve remedial measures.

(d) Dimensions and fabrication details that control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

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

(f) Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.

(g) All holes shall be free of burrs and rough edges.

E39.23 Welding

(a) Welding of steel structures shall be in accordance with CSA W59, "Welded Steel Construction".

(b) All seams shall be continuously welded and free from any slag and splatter. Longitudinal welds shall be a minimum of sixty percent (60%) penetration, except those within 200 mm of baseplates, flanges, and circumferential welds, which shall be one hundred percent (100%) penetration. All circumferential groove welds shall be one hundred (100%) penetration, and where circumferential welds are used at a butt joint, an internal backup strip shall be provided.

(c) Longitudinal seam welds in horizontal supports shall be located at the top of the horizontal members.

(d) All welds shall be ground smooth and flush with the adjacent surface prior to hot-dip galvanizing.

E39.24 Surface Preparation and Cleaning

(a) Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A123 and SSPC Specification SP:6, "Commercial Blast Cleaning," unless otherwise specified herein. The Contractor shall ensure that all exterior and interior surfaces of vertical support members of sign structures are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 610 g/m^2. All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.

(b) The sandblasting and cleaning of sign structures shall be done in the shop.

(c) After the structures have been sandblasted they shall be thoroughly cleaned of all sandblasting abrasive grit and debris, with special attention paid to areas of the structure where sand and debris collect, including but not limited to, behind the gusset plates, handholes and base plate.

(d) After the sign structures have been sandblasted and cleaned, the Contract Administrator will carry out a visual inspection of the structures in the shop before they are shipped to the galvanizing plant.

E39.25 Hot-Dip Galvanizing

(a) The hot-dip galvanizing plant shall be a Regular Member of the American Galvanizers Association, Inc.

(b) All outside surfaces of the overhead sign support structures shall be hot-dip galvanized in accordance with ASTM A123 to a minimum net retention of 610 g/m^2.

(c) Adequate venting and drainage holes shall be provided in enclosed sections for hot- dip galvanizing. The galvanizing facility shall be consulted regarding the size and location of these holes. Holes shall be provided by drilling not burning.

(d) The galvanizing coating on outside surfaces of overhead sign support structures shall be generally smooth and free of blisters, lumpiness and runs. In particular, the outside surfaces of the bottom 2.5 m of the vertical support members shall have a smooth finish equal to the finish on hot-dipped galvanized handrails.

(e) In addition to the provision of corrosion protection by the galvanized coating, the aesthetic appearance of the structure after hot-dip galvanizing will also be a criterion in the acceptance or rejection of the galvanized coating. The galvanized coating on the entire structure shall have a uniform “silver” colour and lustre. Galvanizing with parts of the structure having dull grey coating or streaks or mottled appearance will not be acceptable. If the galvanizing is rejected for aesthetic reasons, the Contractor shall rectify the appearance by applying spray-on molten zinc metallizing with 85/15 zinc/aluminum alloy. The metallizing shall be carried out in the shop before the structure is installed.

(f) Minor defects in the galvanizing coating shall be repaired as specified here below for “Field-Applied Touch-Up Galvanizing”. The Contract Administrator shall be consulted before repairs are made.

(g) Other defects and contaminants in the galvanizing coating, such as heavy dross protrusions, flux inclusions and ash inclusions shall be grounds for rejection of the galvanizing coating system.

(h) The Contractor shall verify the thickness of galvanized coatings as part of their own quality control testing and make their results available to the Contract Administrator.

(i) All threaded couplings shall be rethreaded after the sign structures have been hot-dip galvanized.

(j) The sign structures shall be stored on timber blocking after hot-dip galvanizing.

E39.26 Delivery and Erection

(a) The Contractor shall notify the Contract Administrator at least two (2) Working Days in advance of the anticipated delivery to the Site and erection of the overhead sign support structures.

(b) The sign structures shall be lifted and secured with nylon ropes or other approved methods. Use of steel chains and steel hooks against hot-dip galvanized or powder coated surfaces will not be permitted. The structure components (shaft and arm etc.) shall be placed on timber blocking and secured with nylon ropes during their transportation to the Site.

(c) Refer to E37 for Traffic Management requirements during erection.

E39.27 Attachment of Structure to Anchor Bolts

(a) Each anchor bolt shall be provided with four (4) galvanized nuts: two (2) nuts at the bottom of the anchor bolt to secure the anchor bolt assembly template, one (1) nut below the base plate for levelling the structure, and one (1) nut above the base plate for anchoring the structure.

(b) The anchor bolts shall have a minimum projection of 25 mm above the anchoring nuts.

(c) The distance between the top of the concrete pile and the underside of the levelling nut shall not exceed one (1) anchor bolt diameter.

(d) The threaded portions of the anchor bolts and nuts shall be treated with a wax based lubricant.

(e) The Contractor shall plumb the shaft by adjusting the levelling and anchor nuts.

(f) Levelling nuts and anchor nuts shall be tightened to a snug tight condition, defined as the full effort of an ironworker using an ordinary wrench, or a few impacts of an impact wrench.

(g) The Contractor shall tighten the top anchoring nuts in an alternating “star” type pattern as follows:

(i) for anchor bolts less than or equal to 38 mm diameter: 1/3 of a turn (+20°, -0°) past a snug tight condition;

(ii) for anchor bolts greater than 38 mm diameter: 1/6 of a turn (+20°, -0°) past a snug tight condition.

E39.28 Structural Bolt Installation

(a) Structural bolts for flange and splice connections shall be tightened in accordance with the turn-of-nut method as follows:

(i) alternately tighten all bolts to achieve a snug tight condition. The mating surfaces shall be in firm contact;

(ii) tighten all bolts in accordance with Table 40.1, below;

(iii) following tightening, check all bolts in the joint by hand using an ordinary wrench.

Table 40.1: Required Turns Past Snug Tight for Turn-of-Nut Method

Bolt Diameter *D* (inches)	**Bolt Length up to 4*D***		**Bolt Length over 4*D* to 8*D***		**Bolt Length over 8*D* to 12*D***	
	Length up to	**Required Turns**	**Length Range**	**Required Turns**	**Length Range**	**Required Turns**
1/2”	2”	1/3 ± 30°	2 to 4”	1/2 ± 30°	4 to 6”	2/3 ± 45°
5/8”	2.5”	1/3 ± 30°	2.5 to 5”	1/2 ± 30°	5 to 7.5”	2/3 ± 45°
3/4”	3”	1/3 ± 30°	3 to 6”	1/2 ± 30°	6 to 9”	2/3 ± 45°
7/8”	3.5”	1/3 ± 30°	3.5 to 7”	1/2 ± 30°	7 to 10.5”	2/3 ± 45°
1”	4”	1/3 ± 30°	4 to 8”	1/2 ± 30°	9 to 13.5”	2/3 ± 45°
1 1/8”	4.5”	1/3 ± 30°	4.5 to 9”	1/2 ± 30°	10 to 15”	2/3 ± 45°
1 1/4”	5”	1/3 ± 30°	5 to 10”	1/2 ± 30°	11 to 16.5”	2/3 ± 45°

E39.29 Installation of Sign Panels

(a) The Contractor will be responsible for installation of sign panels on the sign support structures.

(b) The Contractor shall install the sign panels on the sign support structures immediately following erection of the support structures (same day). In no case will a sign support structure be allowed to be erected and left for a significant amount of time (greater than one (1) day) without having the sign panels installed.

(c) Sign panels shall be installed such that the panels are level to ground after all support structure deflection has occurred.

(d) Sign panels shall not be twisted or warped following installation.

E39.30 Rodent Screens

(a) Rodent screens that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation shall be installed in lieu of grout pads at all overhead sign structure bases.

(b) The entire gap shall be covered with an expanded stainless steel metal screen, in accordance with E39.15, “Rodent Screen”. The bottom edge of the expanded stainless steel screen shall be in full contact with the surface of the concrete foundation. The top edge of the expanded stainless steel screen shall not extend beyond the top surface of the structure base plate.

(c) The rodent screen shall be made of one (1) continuous piece of expanded stainless steel with only one (1) overlapping splice where the ends come together and lap a minimum of 75 mm.

(d) The rodent screen shall be attached to the vertical side of the structure baseplate with self-tapping stainless steel screws (#8-1/2” long) complete with stainless steel washers. Pilot holes shall first be drilled into the baseplate to facilitate screw installation. Screws shall be installed at 200 mm on center maximum and at least one screw shall be installed through the overlapping splice to clamp the two (2) layers of rodent screen together.

(e) The two (2) overlapping layers of rodent screen shall also be clamped just above the concrete foundation with a stainless steel fastener assembly consisting of a machine screw (#8-5/8” long) complete with a nut, two (2) flat washers and a lock washer. The rodent screen shall be tightly clamped between the flat washers.

E39.31 Field-Applied Touch-up Galvanizing

(a) Any areas of damaged galvanizing on the sign structures shall receive field-applied touch-up galvanizing.

(b) Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose, scale, rust, paint, grease, dirt, or other contaminants.

(c) For self-fluxing, low temperature, zinc based alloy rods, preheat the surface to three hundred and fifteen degrees Celsius (315°C) and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond four hundred degrees Celsius (400°C) and to not apply direct flame to the alloy rods.

(d) For cold applied galvanizing compound, the approved product shall be applied by either a brush or roller. The compound shall be applied in three (3) coats, with each coat having a dry film thickness of 60 µm (2.36 mils). Each coat shall be left to dry for a minimum of one (1) hour before the application of the next coat.

QUALITY CONTROL AND ASSURANCE

E39.32 Quality Control

(a) General

(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 Work.

(ii) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection approval 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.

(iii) 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.

(iv) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

(b) Welding Qualifications

(i) The Contractor shall produce evidence that the plant has recently been fully approved by the Canadian Welding Bureau (C.W.B.) to the requirements of CSA W47.1 Division 2.1 for welding of steel structures.

(ii) Approved welding procedures shall be submitted to the Contract Administrator prior to fabrication of any steel items.

(c) Testing

(i) In addition to the Contractor's own quality control testing of all materials, welding procedures and steel fabrication including hot-dip galvanizing will be inspected and tested by the Contract Administrator to ascertain compliance with the Specifications and Drawings.

(ii) The Contract Administrator will hire a testing agency certified by the Canadian Welding Bureau to carry out shop fabrication inspection and testing before the overhead sign support structures are approved ready for installation of coating system. The inspector shall have access to all of the fabricator’s normal quality control records for this Contract, specified herein. Inspection and testing will include:

i. visual inspection of one hundred percent (100%) of welds;
ii. ultrasonic testing of one hundred percent (100%) of full penetration sections of longitudinal seam welds and circumferential butt welds;
iii. magnetic particle testing of a random ten percent (10%) of partial penetration sections of longitudinal seam welds;
iv. ultrasonic testing of twenty-five percent (25%) of base plate and flange plate welds;
v. inspection of hot-dip galvanizing and coating thickness.

(iii) Welds that are found by any of the inspection and testing methods to be inadequate and unsatisfactory shall be repaired in accordance with CSA W59 and then retested. The cost of the repairs and the cost of the retest shall be paid for by the Contractor.

(iv) No repair shall be made until agreed to by the Contract Administrator.

(v) Defects in hot-dip galvanizing shall be rectified as directed by the Contract Administrator.

(d) Unacceptable Work

(i) Any Work found to be unacceptable shall be corrected in accordance with CSA W59;

(ii) No repair shall be made until agreed to by the Contract Administrator.

E39.33 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.

MEASUREMENT AND PAYMENT

E39.34 General

E39.34.1 Supply and Installation of New Steel Overhead Sign Support Structures

(a) Supply and installation of new steel overhead sign support structures will be measured on a unit basis per new steel overhead sign support structure supplied and installed, and paid for at the Contract Unit Price for “Items of Work" listed here below, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the Work included in this Specification, accepted and measured by the Contract Administrator.

(b) Items of Work:

Supply and Installation of New Steel Overhead Sign Support Structures:

(i) S568 - Lagimodiere Blvd N/B, Concordia Avenue Exit

E39.34.2 The installation of sign panels shall be considered incidental to the Work.

E40. SUPPLY AND INSTALLATION OF REFLECTIVE GUIDE SIGN PANELS

DESCRIPTION

E40.1 General

(a) The work covered under this item shall include all operations related to the supply and installation of the reflective guide sign panels for overhead mounted guide sign applications.

(b) The Work to be done 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.

E40.2 References

(a) ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

(b) Manual of Uniform Traffic Control Devices for Canada (MUTCD)

(c) ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

(d) ASTM A320 Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service

(e) ASTM D4956 Standard Specification for Retroreflective Sheeting for Traffic Control

E40.3 Scope of Work (describe the signs to be supplied under this contract)

E40.3.1 Supply of guide signs shall include the following:

(a) Supply of one (1) new guide sign on Lagimodiere Blvd N/B, Concordia Avenue Exit new overhead sign support structure S568.

E40.3.2 Graphical content to be supplied by the Contract Administrator:

(a) Acting on behalf of the City of Winnipeg, the Contract Administrator will supply the Contractor with the following information within fourteen (14) calendar days of the request by the Contractor:

(i) Electronic image file (PDF or JPEG) of the sign panel graphical content

(ii) Indication of character font, height, kern, line spacing, minimum edge distances, etc.

(iii) Indication of all colors for the sign panel content and background materials

(iv) Overall sign panel dimensions, with the sign panel height in increments of 305 mm.

(v) Number and spacing of vertical backing bars (“T-bars”).

(vi) All dimensions will be shown in metric units

E40.3.3 Installation of Guide Sign

(a) The Contractor shall install the guide signs as in accordance with the Plans.

E40.4 Submittals

(a) Shop Drawings for each sign panel to be supplied shall be submitted to the Contract Administrator by the contactor at least fourteen (14) calendar days prior to the commencement of any sign panel fabrication work.

(b) Shop Drawings shall conform to the following

(i) submitted in electrically generated PDF format

(ii) be of natural scale (1 horizontal to 1 vertical)

(iii) must be in full color. Scanned copies of printed materials will not be accepted.

(iv) Must be an accurate representation of the font, character size, spacing, edge distances, etc.

(v) Show the spacing and edge distances of all vertical backing bars. For Contracts which include sign panel installation and/or installation of sign panels on new or existing structures, the location of the aluminum backing bars shown on the Shop Drawings shall take into consideration of potential conflicts with the mounting configuration on the structure, and shall be coordinated with respect to the shop drawings and/or as-built drawings of the sign panel support structure to which it will be mounted.

(vi) Must show at least one sign panel cross section taken vertically through the sign panel showing the aluminum substrate extrusion shape, profile, and connecting hardware information.

(vii) All dimensions shall be shown in metric units

(viii) Must include a statement of sign panel mass, in kilograms.

E40.5 Sheeting Product Data Sheet

(a) Submit the product data sheet and manufacturer's recommendations for installation for the selected sheeting material(s) to the Contract Administrator at least fourteen (14) Calendar Days prior to commencement of work.

E40.6 Connecting hardware

(a) Submit samples of the connecting hardware to the Contract Administrator at least fourteen (14) Calendar Days prior to commencement of work.

MATERIALS

E40.7 General

(a) All material shall be new, previously unused.

(i) The re-use of sign panels after chemical stripping or sanding of the panel will not be accepted.

(b) 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.

E40.8 Retro-reflective Sheeting

(a) Highway sign retro reflective sheeting shall be fabricated using sign sheeting material, conforming to ASTM D4956 Standard Specification for Retro-reflective Sheeting for Traffic Control (latest edition) to Type XI, (full cube prismatic), encapsulated by a flexible transparent plastic film having a smooth outer surface.

(b) Sheeting shall have a pre-coated adhesive backing protected by an easily removable liner and shall conform to ASTM D4956 Class 1; the adhesive backing shall be pressure-sensitive, require no heat, solvent, or other preparation for adhesion to smooth, clean surfaces.

E40.9 Retro-reflective Sheeting for Sign Panel Content

(a) Sign panel content including lettering, line work, symbols etc. shall be fabricated from reflective sign sheeting material meeting the same requirements specified herein for the retro-reflective sheeting and securely affixed to the face of the sign panel.

(b) The adhesive backing for the panel content shall be ASTM D4956 Class 1; the adhesive backing shall be pressure-sensitive, require no heat, solvent, or other preparation for adhesion to smooth, clean surfaces.

E40.10 Colors

(a) All colors used shall conform to ASTM D4956 and as indicated on the graphical content information to be supplied by the Contract Administrator, and in general conformance with the Manual of Uniform Traffic Control Devices for Canada (MUTCD) latest edition.

E40.11 Substrate

(a) Sign panel substrate shall consist of horizontally oriented and connected "channels" made from extruded aluminum alloy 6036-T6 conforming to Alcan die number 73247 or approved equal, with anodize treatment, each channel approximately 305 mm in exposed height.

(b) Aluminum shall conform to ASTM B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

E40.12 Panel Clips and Bolts

(a) Adjacent “channels” of substrate aluminum extrusions shall be connected with panel clips and bolts with geometry as shown on drawing TE-045H published by Manitoba Transportation and Infrastructure Traffic Engineering, as provided on the Transportation and Infrastructure website (https://www.gov.mb.ca/mti/traffic/signs.html), or approved equal.

(b) Clips shall conform to ASTM B221 alloy 6061-T6.

(c) Clip bolts shall be 3/8” diameter x 3/4” long stainless steel conforming to ASTM A193 or A320, Grade 304 minimum, complete with a stainless steel locknut.

(d) The head of the bolt shall be fabricated such that it slides into the substrate extrusion flanges while preventing rotation such that the nut can be tightened when connecting panel clips.

E40.13 Post Clips and Bolts

(a) Substrate aluminum “channels” shall be connected to vertical backing bars (“T-bars”) using post clips and stainless steel bolts with geometry as shown on drawing TE-045i published by Manitoba Transportation and Infrastructure Traffic Engineering, as provided on the Transportation and Infrastructure website (https://www.gov.mb.ca/mti/traffic/signs.html), or approved equal.

(b) Post clips shall be fabricated from aluminum alloy 6356T.

(c) Post clip bolts shall be 3/8” diameter x 1-3/4” long rectangular head T-bolts, from stainless steel conforming to ASTM A193 or A320, Grade 304 minimum, complete with a stainless steel washer and stainless steel locknut.

(d) The rectangular head of the T-bolts shall be approximately 25 mm x 15 mm and fabricated such that it slides into the substrate extrusion flanges while preventing rotation such that the nut can be tightened when connecting post clips.

E40.14 Vertical Backing Bars (“T-Bars”)

(a) Vertical backing bars (“T-Bars”) shall be of a type and grade as indicated on the Contract Drawings or as indicated elsewhere in the Contract Documents

(i) If not indicated on the contract drawings or specified elsewhere in the Contract Documents, vertical aluminum backing bars (“T-Bars”) shall be extruded aluminum T-sections conform to ASTM B221 Grade 6061-T6, and be 102 mm deep x 76 mm wide x 8 mm thick minimum.

(b) Vertical backing bars (“T-Bars”) shall be supplied and installed on the back of the sign panel substrate in accordance with this specification.

E40.15 Sign Panel Mounting Brackets

(a) For Contracts including sign panel installation on sign support structures using mounting brackets, the specifications for support structure mounting brackets and associated hardware shall be specified elsewhere.

EQUIPMENT

E40.16 General

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

CONSTRUCTION METHODS

E40.17 General

(a) Sign panels shall be fabricated in a controlled indoor shop-like environment.

E40.18 Substrate assembly

(a) Edges of all substrate material shall be de-burred to provide a smooth finished edge.

(b) All connecting hardware shall be firmly tightened and all surfaces firmly in contact, such that when connected the panel is rigidly and firmly fastened together into a single panel.

(c) Panel clips and bolts shall be installed as follows:

(i) Connect adjacent aluminum substrate extrusions using panel clips, complete with 2 bolts per clip;

(ii) Horizontal spacing between connecting hardware sets shall be maximum 300 mm on centre, in a staggered fashion between rows of slots, except for the last slots at either end of the section or panel, at which locations a connecting hardware set shall be provided.

(iii) All nuts shall be tightened to a snug-tight condition, taking care not to over-tighten resulting in stripping of threads or failure of the lock nut.

(d) Contractor shall ensure that all connection hardware supplied and installed as specified herein are compatible and when connected result in a rigid sign panel assembly.

E40.19 Sheeting

(a) Sign panel sheeting material shall be correctly applied in accordance with the sheeting manufacturer's recommendations and industry accepted quality practices.

(b) Prepare the sign panel substrate in accordance with the retro-reflective sheeting manufacturer's specifications prior to adhesion of the sheeting.

(c) Retro-reflective sheeting shall be properly trimmed at either end of the panel so to be even with the end of the substrate.

(d) No more than one (1) material seam per length of panel will be permitted. Excessive patching with off-cut reflective material patched together will not be accepted.

(e) All material applied shall show no signs of wrinkles or improper adhesion to the viewed surface of the sign panel substrate.

(f) Reflective material applied shall be completely edge curled vertically down both sides of the full length of the sign panel and the material shall show no signs of wrinkles or excessive bubbling on either sides of the edges of the panel after sheeting application.

(g) Reflective material shall wrap over the vertical sides of the panel no more than 8 mm and should fit inside the groove edge provided in the aluminum extrusion, or terminated as otherwise recommended by the sheeting manufacturer.

(h) The presence of tears, holes, scrapes, compressed cells or patches will be grounds of rejection.

(i) Any joints must be sealed in accordance with the sheeting manufacturer's recommendations.

E40.20 Fabrication Tolerance

(a) Dimensions of the overall sign panel (height and width) shall be fabricated to within 1% of the specified dimension.

(b) Graphical content including character height, spacing, line spacing, and line weights shall not deviate from the specified dimension by more than 5%.

(c) If present, deviations within the above noted tolerances shall be uniform. In the sole judgement of the Contract Administrator, noticeable deviations in the fabrication tolerance between individual graphical elements, even if they within the above specified limits, are grounds for sign panel rejection. For example, if the line weight of one particular letter on the sign panel was noticeably different than all other letters, the panel would be rejected.

(d) The flatness of the sign panel shall be measured using a 3 m long straight edge placed flush to the front face of the sign panel in any direction. The maximum single deviation

from the straight edge shall be no greater than 15 mm. Multiple deviations (i.e. waviness) in the panel shall be cause for rejection even if deviations are less than 15 mm.

(e) Regardless of any measured deviation, no defect in the sign panel shall result in a reduction in the legibility of the sign, or the retro-reflective performance of the panel. The Contract Administrator shall be the sole judge as to whether a defect is present and if it requires repair or replacement of the sign panel.

E40.21 Manufacturer's Identification

(a) All signs shall be clearly and permanently labeled using durable weather resistant material or engraving with an identification coding. The coding shall appear in characters 6-10 mm high on the lower right back of the sign and shall be imparted in such a manner that the front face of the sign is not damaged. The manufacturer shall include the following information on the label:

(i) Manufacturer's name

(ii) Month and year of manufacture, in MM-YYYY format.

(iii) Brand of sign sheeting material

E40.22 Connecting Vertical Backing Bars ("T-bars")

(a) Vertical backing bars ("T-bars") shall be installed on the back of the sign panel substrate square to the sign panel, extend the full height of the sign panel, and in accordance with the spacing shown on the Contract Drawings.

(b) Where no Contract Drawings are applicable, or if the spacing is not indicated, vertical backing bars shall be installed on the back of the sign panel substrate as indicated in the following table, or as directed by the Contract Administrator:

Table E40.1: Backing Bar Spacing Requirements

Typical Sign Width	Number of Vertical Backing Bars	Dimension A [# spaces] x [mm]	Dimension B [mm]
7320 mm (24 ft)	6	5 x 1220	610
6710 mm (22 ft)	5	4 x 1425	505
6100 mm (20 ft)	5	4 x 1225	600
5490 mm (18 ft)	4	3 x 1430	600
4880 mm (16 ft)	4	3 x 1220	610
4270 mm (14 ft)	4	3 x 1200	335
3660 mm (12 ft)	3	2 x 1400	430
3050 mm (10 ft)	3	2 x 1200	325
2440 mm (8 ft)	2	1 x 1000	720

(c) No holes shall be drilled in the backing bars at the time of fabrication. If required, holes in the backing bars shall only be field drilled at the time of final installation on the support structure to ensure a level and planar sign panel when mounted to the support structure.

(d) A post clip and bolt shall be provided to connect each side of each vertical backing bar ("T-bar") to the flanges of the aluminum substrate extrusion. The maximum spacing of the post clips and bolts shall be 305 mm and they shall be provided on alternating sides of the vertical backing bar,

(i) In addition, the top and bottom of the vertical backing bar shall be fitted with a post clip and bolt on both sides of the backing bar.

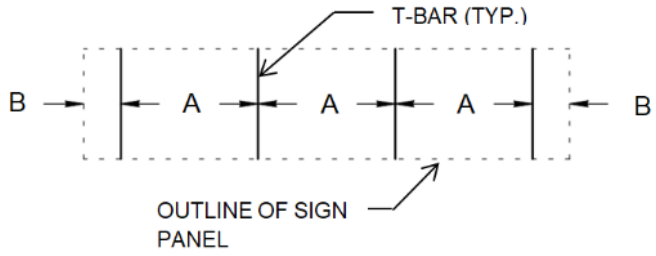
(e) All nuts shall be tightened to a snug-tight condition, taking care not to over-tighten resulting in stripping of threads or failure of the lock nuts or washers.

E40.23 Packaging and Delivery

(a) Contractor shall package each preassembled sign panel individually prior to delivery. Packaging shall protect the sign panel from damage to the sheeting or aluminum components and hardware.

(b) Contractor shall be responsible for safe handling, lifting, hauling, transporting and offloading of sign panels.

(c) Sign panels shall be protected from damaging effects including scratches, warping, and denting which may be caused during handling.



(d) For Contracts that do not include installation of the sign panel and are for supply and delivery only, the Contractor shall offload the sign panels at the stated delivery location, and place the sign panel(s) in a location directed by the Contract Administrator or designate.

E40.24 Delivery Location

(a) For Contracts that include sign panel installation, sign panels shall be delivered to the work site under the care of the Contractor. Sign panels shall be appropriately protected and stored on site or in a suitable location until final installation occurs.

(b) Damaged sign panels shall be repaired or replaced to the satisfaction of the Contract Administrator at no additional cost to the City of Winnipeg.

QUALITY CONTROL AND QUALITY ASSURANCE

E40.25 General

(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 or by the Quality Assurance Testing Laboratory designated by the Contract Administrator.

(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.

(c) The Contract Administrator reserves the right to reject any materials or work which are not in accordance with the requirements of this specification.

(d) Quality Control shall be undertaken by the Contractor. Quality Assurance testing shall be undertaken by the Contract Administrator.

(e) The Contract Administrator shall be afforded full access for the inspection and control and assurance testing of sign panel constituent materials, both at the work site and at the location of sign panel fabrication. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

E40.26 Field Performance Requirements

(a) Reflective sheeting, processed and applied according to the sheeting manufacturer's recommendations (or as specified in this specification when there is an exception to the manufacturer's recommendations), shall perform satisfactorily for the number of years required under Warranty as stated in this Specification.

(b) The sheeting (including all sign panel content) shall be considered unsatisfactory if it has deteriorated due to natural causes (precluding unnatural causes such as vehicle impact or vandalism), to the extent that the sign is ineffective for its intended purpose, when viewed from a moving vehicle under normal day and night driving conditions or shows any of the following defects:

(i) Cracks discernible with the unaided eye from the driver's position while in an outside lane at a distance of 15 meters (50 feet) or greater from the sign

(ii) Peeling in excess of 6.4 millimeters (1/4 inch)

(iii) Shrinkage in excess of 3.2 millimeters (1/8 inch) total per 1.2 meters (48 inches) of sheeting width

(iv) Fading or loss of color to the extent that color fails to meet the requirements in ASTM D4956.

(v) Loss of reflectivity to a level below 20%of the minimum values specified in ASTM D4956 or in this specification for new sheeting when measured at the angles specified for each type.

E40.27 Warranty

(a) Before final acceptance of the sign panel(s) by the Contract Administrator, the sign panel Supplier shall provide the Contract Administrator with a written warranty stating that they will perform satisfactorily in the field for a period of twelve (12) years from the issuance of the Certificate of Total Performance. The Supplier shall state that they have reviewed the fabrication and installation procedures and find them in accordance with their recommendations.

(i) The Supplier shall warranty the replacement of the entire sign panel, including removal of the existing panel and installation of replacement panel in the field, at no cost to the City of Winnipeg or the Contractor, in the event that the sign panel(s) do not meet the field performance requirements specified in E40.26 for a period of seven (7) years from the issuance of the Certificate of Total Performance.

(ii) The Supplier shall warranty the replacement of the sheeting material only, including panel removal and reinstallation in the field, at no cost to the City of Winnipeg or the Contractor, in the event that the sign panel(s) do not meet the field performance requirements specified in E40.26 during the period of eight (8) to twelve (12) years from the issuance of the Certificate of Total Performance.

MEASUREMENT AND PAYMENT

E40.28 General

E40.28.1 Supply and Installation of Sign Panels

(a) Supply and Installation of Sign Panels will not be measured. The Supply and Installation of Sign Panels will be paid for at the Contract Lump Sum Price for "Supply

and Installation of Sign Panels", which 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.

RAIL

E41. RAIL

E41.1 CPKC's Keewatin Subdivision – Site Background

(a) This project is located on CPKC's Keewatin Subdivision which passes below the Lagimodiere twin overpasses (over Concordia Ave. and CPKC Keewatin). These tracks are CPKC's mainline and yard tracks which move rail traffic 24 hours a day and 7 days a week. These lines are critical to CPKC's business interests and therefore, rail operations on these lines must be maintained without interruption, throughout construction, unless specific exception(s) are permitted. Any such exception(s) shall be at the sole discretion of CPKC Rail.

DESCRIPTION

E41.2 General

(a) This Specification shall cover all requirements and construction works on or near CPKC ROW.

(b) This Specification outlines all requirements for preparing and submitting a Construction Plan for working near and over/within the CPKC ROW.

(c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tolls, supplies, and all tings necessary for and incidental to the satisfactory performance, and completion of all Works as herein specified.

(d) These general requirements shall be read in conjunction with Canadian Pacific Railway (CPKC) Minimum Safety Requirements for Contractors Working on Railway Property and where applicable the more restrictive requirement shall apply.

(i) The Contractor shall comply fully with all requirements of the Railway in planning, scheduling and control of the works within the Railway right-of-way.

(ii) No work shall be progressed by the Contractor on, above or below the Railway right-of-way until proof of liability insurance in accordance with requirements stipulated elsewhere have been complied with.

(iii) The Contractor shall plan and carry out the works in a manner that does not interfere with safe movement of rail traffic or cause clearance restrictions and minimizes the requirement for railway flagging. The Contractor's working plans and schedule shall be reviewed and approved by the Contract Administrator and the Railway to ensure compliance with the Railway's requirements.

(iv) The Contractor shall be liable for a period of one year from the date of completion of the work for all costs, direct and indirect, incurred by the Railway due to the settlement of track(s) or any other problems related to the Railway's operations, property or infrastructure that occur as a result of the Contractor's operations.

E41.3 References

(a) All Works related to CPKC shall be completed in accordance with the following CPKC Rail specifications and requirements apply to the work.

(i) Canadian Pacific – Flagging Protection Protocol

(ii) CPKC – Flagging Application Form Engineering Services Canada 2025

(iii) CPKC – Geotechnical Protocol for Pipeline and Utility Crossing(s) Under Railway Tracks, May 15, 2025 (Draft)

(iv) CPKC - Utility Crossing Application Form 2025

(v) Canadian Pacific Railway – Guidelines for Excavation on CPR property

(vi) CPKC Home Safe – Minimum Safety Requirements for Contractors Working on CPKC Property – Canada November 8, 2023

(vii) Canadian Pacific Railway – Operation Constraint for Work on, above or below Railway Right of Way, May 1, 2009

(viii) Canadian Pacific – Overtime Policy for all Canadian Engineering Services, 2013

(ix) CPKC – Proposed Overhead Structure Clearances for New Construction – January 5, 2015

(b) An example Construction Plan has been prepared and included within Appendix 'E' as reference only, to demonstrate the typical level of detail required for a complete submission.

(c) The document titled "Lagimodiere Twin Overpasses Over Concordia Ave & CPKC Mile 122.4 Keewatin Subdivision – Construction Methodology is included in Appendix 'E' for informational and references purposes only.

(d) The Contractor remains solely responsible for developing, submitting and obtaining approval for its own comprehensive Construction Plan.

E41.4 Duty to Communicate and Coordinate

(a) The Contractor shall at all times communicate and coordinate with the Contract Administrator and CPKC regarding rail-related works and services to be provided by CPKC. The Contractor shall have no basis for additional costs or claims for these activities.

(b) The Contractor shall appoint a designated employee to be the primary point of contact for all rail-related communication and coordination.

(i) The Contractor shall arrange a daily site meeting with the Railway flagperson to review daily work plan and safety requirements prior to the commencement of daily work.

E41.5 Railway Flagging Requirements

(a) The City of Winnipeg shall be responsible for the cost of flagging provided by CPKC for the duration of the contract. The Contractor shall arrange with the Contract Administrator for rail flagging service and flagperson's to be provided by CPKC.

(b) All activities subject to flagging must be completed under flagging protection.

(c) Continuous daily flagging protection will be provided at no cost to the Contractor starting on the first day of work subject to flagging protection, as indicated on their approved Schedule Submittal.

(d) Continuous daily flagging protection will be terminated when work subject to flagging protection has ceased.

(e) For the Contractor's awareness, all CPKC charges for Railway flagperson services will be invoiced directly to the City. The City of Winnipeg has arranged with CPKC to pay for flagging for up to 550 working days. The Contractor shall schedule their operations to ensure all work that requires flagging is completed within the time frame. Any flagging costs beyond 550 days will be at the Contractor's expense at a charge of $3,000.00 per day plus tax. The City will process a Change Order deducting any additional flagging costs from progress payments to the Contractor.

(f) In the event that flagging protection is arranged for a given day and the Contractor does not show up at the site, or no work is done that day, a minimum charge of 8 hours for flagging services will be invoiced to the City of Winnipeg. The City of Winnipeg will deduct the cost there of, as certified by the Contract Administrator, from any payment due then or thereafter due to the Contractor.

(g) To request flagging, the Contractor through the Contract Administrator will need to submit a written request (Construction Plan; CPKC – Flagging Application Form Engineering Services Canada 2025) to CPKC four (4) weeks in advance of the date for flagging.

(h) The Contractor shall schedule construction to minimize the overall duration of continuous daily flagging. The Contractor's Schedule Submission (D17) shall indicate every work activity that is subject to flagging protection. Activities for which flagging protection may apply to a portion of the activity, but not all (for example, demolition of concrete deck) shall be broken down into components that are subject to flagging (for example, demolition of Span 2 concrete deck) shall be required to submit a detailed schedule of when flagging services are anticipated. This schedule will be reviewed by CPKC and the Contract Administrator, and if accepted, will be used as a 'baseline' to schedule flagging services. The Contractor, in conjunction with the approved schedule, will need to request of CPKC, at least four (4) weeks in advance, that flagperson's are not to be supplied for a period of activity for which CPKC protection is not required. Should the Contractor schedule flagging, and not utilize the service, the Contractor shall reimburse the City for the cost of any unused service.

(i) Bulletined flagging positions may only be cancelled by providing the Railway with written notice a minimum of 10 business days prior to the cancellation date.

(ii) Bulletined flagging positions will be invoiced a minimum of 8 hours per day, 5 days per week, until properly cancelled.

(iii) Flagging shall commence on a date mutually agreed to by CPKC, the Contract Administrator and the Contractor and will continue without interruption until the Contractor, Contract Administrator and CPKC mutually agree that flagging is not required.

(iv) The Contractor shall provide the required notice to the Contract Administrator for the requirements of a flagperson. The Contract Administrator shall liaise with CPKC.

(v) The Contractor shall assume that Railway flagging will be typically available on site approximately 10 hours per day, approximately 07:30 to 17:30, Monday through Friday. Extended track protection hours may be provided by the onsite CPKC flagperson if approved.

(vi) Flagging is based on two flagpersons per day to achieve a minimum of 10 hours of track protection per day of flagging. One flagger will be on site at a time, except there will be an hour overlap at shift change.

(vii) The provision of a Railway flagperson by the Railway shall not relieve the Contractor from liability for damages to Railway facilities caused by the Contractor's operations, its agent or subcontractor(s) acting on its behalf.

(viii) All communications with the Railway shall include the Contract Administrator. The Contractor shall have a Superintendent present at all times, capable of receiving instructions from the Contract Administrator or CPKC regarding work on the Railway Right-of-Way.

(ix) The Contractor shall make the following facilities available for the flag person's use during the course of the project: washroom/lavatory.

(x) All instructions from the Railway flagperson shall be obeyed immediately by all personnel on site. Work may be stopped under the authority of the Railway flagperson at any time to accommodate train movements or address safety concerns.

(xi) A Railway flagperson will be required when any personnel or equipment is working under the following conditions:

i. working within the Railway right-of-way, or
ii. working within 15 metres of the centerline of the nearest track or,
iii. on the structure or,
iv. any falsework or equipment or protective devices where the work, in the opinion of the Contract Administrator or the Railway, may be exposed to or interfere with the operation of the Railway tracks.

v. Conducting any activities that are deemed by the Contract Administrator or the Railway to be subject to flagging protection.

(xii) When the work is confined to the City of Winnipeg's right-of-way and the roadway on which the work is being performed runs parallel to the Railway tracks and right-of-way, railway flagging shall be required when the Contractor's use of equipment could obstruct the Railway track in any seen or unforeseen manner.

(xiii) When a Railway flagperson is required, the Contractor, through the Contract Administrator, shall provide a minimum written notice of 30 days, in advance, to allow the Railway time to bulletin the position to the unionized labour force. If prior to work commencing, the Contractor, through the Contract Administrator, should receive confirmation that such Railway flagperson is not available, the Contractor, through the Contract Administrator, shall reschedule the proposed work to a date and time when such flagging protection will be available.

(xiv) The Railway flagpersons will be available a minimum of 50 hours per week inclusive of travel time, to and from assigned headquarters, and time to set up and remove track protection each day.

(xv) No personnel shall enter the Railway Right-of-Way at any time, unless under the supervision of a Railway flagperson.

(xvi) All protection systems shall be installed in one continuous operation until completion, while CPKC flagperson is on-site providing track protection.

(xvii) Refer to Appendix 'D' for the full requirements of CPKC Rail flagperson.

E41.6 Track Closure Requirements

(a) The work of this Contract has been developed based on work being completed under flagging protection. Track Blocks have been proposed for girder raising/lowering for bearing replacement and girder FRP strengthening. Track Blocks shall be confirmed based on the Contractor's Construction Plan submission to CPKC.

(b) Except for a Track Block, all work executed within the CPKC Right-of-Way by the Contractor shall be carried out ensuring the continued safe movement of rail traffic. The Contractor can undertake approved work within CPKC operating corridor by obtaining direction throughout the work shift from the CPKC flagperson and will need to plan their work so as not to interfere with train operations. The Contractor shall be liable for the cost of train delays and for the cost of repairs to the track as a result of damage caused by their operation.

(c) If a Track Block is required, the Contractor through the Contract Administrator will need to submit a written request (Construction Plan; CPKC – Flagging Application Form Engineering Services Canada 2025) to CPKC four (4) weeks in advance of the date. CPKC Flagging Application document shall be used for flagging and Track Block requests. The contractor will need to provide a detailed explanation of what the outage is for, a work plan and details of how they expect to complete the work and return the track to service at the end of the track outage. The request will then be negotiated with CPKC to obtain the Track Block that fits CPKC's operating requirements and the work schedule of the Contractor. The Contractor shall note that track closures may be scheduled on holidays, weekends, and during night time, subject to CPKC's train schedule.

(d) If a Track Block agreement is made, the Contractor will be required to submit a detailed plan (Construction Plan) describing construction sequence that has as many intermediate steps (describing all activities planned in 15 minute intervals) to permit the work to be completed. Where applicable the plan should contain schematic diagrams, equipment details, laydown areas, detailed breakdown for sequence of work, labour resources, lift design, applicable approved shop drawings and calculations, bracings, contingency plans and temporary works.

(e) Equipment details include, but are not limited to:

(i) Number of equipment on site;

(ii) Equipment descriptions;

(iii) Location of equipment with respect to the bridge and the CPKC track;
(iv) Detailed description of methods and equipment to be used in handling materials;
(v) Standby equipment; and
(vi) Current calibration certificates for all equipment and standby equipment.

(f) Labour resources include, but are not limited to:
(i) Type of crews present to perform the work;
(ii) Length of each shift, number of shifts per crew and crew leaders;
(iii) Work cycle
(iv) Number of workers in each crew and number of crews;
(v) Name of the leader of each crew and his experience in bridge work;
(vi) Emergency contact list.

(g) The Contractor shall also develop and submit a contingency plan that deals with actions that the Contractor will take to secure the work site for safe train movement at the end of the Track Block if for some unforeseen reason the work cannot be accomplished as planned.

(h) Seven (7) days and twenty-four (24) hours prior to the commencement of the agreed upon Major Track Closure date, the Contractor shall call upon all key personnel executing the work to attend an organized meeting with the Contract Administrator and CPKC to review:
(i) All activities to be executed during that specific track closure;
(ii) Methodology and equipment to be used, including backup plans;
(iii) Conduct an audit to verify that all materials at the storage site are on hand and discuss loading and unloading procedures;
(iv) Discuss with all participants the expected progress;
(v) Review all safety compliance procedures.

(i) At least twenty-four (24) hours prior to the scheduled track closures, the Contractor shall have all resources and equipment in place to carry out the work for that particular Track Block and complete an onsite meeting.

E41.7 Construction Requirements and Operational Constraints

(a) The Contractor’s work shall in no way impede the train operations.

(b) In no case shall the Contractor or any of the Contractor's equipment or personnel work closer than 3.66 metres from the nearest rail of the nearest track without prior written consent of Contract Administrator and CPKC, except as noted and to the limits stated in the Appendix ‘D’.

(c) All access ways must be maintained to a level that will permit passage by CPKC maintenance and engineering vehicles at all times.

(d) The Contractor shall coordinate the installation of approved debris containment systems, track protection and rail protection with CPKC flagperson where required.

(e) The Contractor shall not be permitted to cross any Railway tracks with equipment or vehicles except as described herein.

(f) Contractor's personnel will only be permitted to cross the Railway tracks under the protection of the Railway flagperson, unless it is at regular road-rail crossing and the Contractor follows the traffic and rail rules as public crossing. Track crossings by personnel are not anticipated for this project, however, should track crossing be required, the operation must be pre-approved by CPKC.

(g) The construction of a temporary construction crossing to accommodate equipment and vehicles crossing the tracks will only be permitted where, in the opinion of the Railway, it is safe to do so and subject to a temporary crossing agreement being executed. It is anticipated that one or more temporary crossing will be permitted by CPKC and the application fee, installation, and maintenance costs will be borne by the City. The

Contractor shall submit a request for the temporary construction crossing in writing to CPKC 60 days in advance of the crossing installation. The Contractor shall abide by all operating requirements specified by CPKC when using the temporary track crossing.

(h) The Contractor shall notify CPKC with the scope of work to be performed and shall allow CPKC to review the need for track protection during the proposed work.

(i) No working platform or debris containment system shall extend below the existing bridge girders without the review and approval of CPKC. Shop drawings for all temporary works must be reviewed by CPKC prior to installation. A certificate of conformance from the Contractor's design engineer will be required after the installation of the debris containment system.

(j) Scaffolding, work platforms/falsework, materials, or equipment shall not impede the minimum track clearance envelope, except as specifically detailed in Appendix 'D' or as approved in writing by the Contract Administrator and CPKC.

(k) The Contractor shall provide full details of their plans for track and rail protection, debris containment, scaffolding, formwork construction, formwork removal, shoring, falsework and equipment placement as part of their Construction Plan. Allow a minimum of four (4) weeks for review by the CPKC and their representatives. All temporary structures shall be stamped and signed by a Professional Engineer in good standing in the province of the project location. Engineered plans and detailed design calculations shall be forwarded for review.

(l) All scaffolding, formwork, working platforms and any other protective coverings to be used on the project must be satisfactorily secured such that they will not come loose by the movement of passing high speed trains or by weather elements such as wind.

(m) All personnel and equipment must stop work on the approach and during the passing of any train when said personnel and equipment is on the Railway right-of-way, or within 15 metres of the centerline of the nearest track; or when said personnel and equipment is in the vicinity of the track(s) and where the work, in the opinion of the Contract Administrator or the Railway, may be exposed to, or interfere with the operations of the Railway.

(n) The Contractor shall cease work when staff and equipment (including extended booms, excavator arms, Bridgemaster, etc.) are situated horizontally within 15 m to the track (below the bridge deck).

(o) The Contractor shall ensure that both rails of the same track are never connected with any conductor of electricity such as a steel measuring tape or metal traction equipment.

(p) The Contractor shall maintain positive drainage during construction.

(q) Environmental protection measures and procedures shall be as per CPKC's environmental guidelines, located in Appendix 'D'.

(r) No material or debris will be permitted to be stored or stockpiled on the Railway right-of-way. The Railway right-of-way shall be restored to its original condition at the end of the project including track ballast that has become fouled as a result of the construction with no additional cost to the City or Railway.

(s) Protect the project area from vandalism. No debris shall be left where vandals might toss it onto a passing train or onto the rail tracks.

(t) The Contractor shall complete visual inspection of the tracks below the bridge during work days to ensure no debris or construction material have fallen or tossed on CPKC right-of-way. The visual inspection shall be completed from a distance of 15 m away from the rail tracks. Should debris or refuse be identified during the inspection, the Contractor shall notify the Contract Administrator who will further notify and coordinate with CPKC to remove the debris/refuse from the CPKC right-of-way.

(u) On work days when a flagperson is present to accommodate a Minor Track Closure, the Contractor shall complete visual inspection of the tracks below the bridge before the flagperson leaves for the day to ensure no debris, construction material or equipment have been left within the CPKC right of way. Any observed material, equipment or debris shall

be collected and removed from the Railway right of way before the flagperson leaves the site.

(v) The tracks shall be protected and no equipment shall be placed on the tracks.

(w) The contractor is fully responsible for adequate protection of all utilities, services, tracks, roadway etc. during construction. Method and design of protection to be submitted to Contract Administrator and CPKC for approval.

E41.8 Safety Requirements

(a) Contractor shall refer to and follow CPKC Safety requirements within or near CPKC ROW. https://www8.cpr.ca/snpevweb/Snp/html/SafetyRegulations.html

E41.9 Emergency Contact Numbers

(a) CP Police Communication Centre: 1-800-716-9132

(b) CP Calgary Operations Center: 1-800-795-7851

(identify location as CPKC Mile 122.4 Keewatin Subdivision)

E41.10 Contact person on behalf of CPKC

Iyonia Rabayaa, P.Eng.
Project Manager – Transportation - Rail
Mobile: 1-587-335-9175
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Calgary, AB T2C 5P2, Canada

E41.11 CPKC's Working Constraints

(a) The Contractor shall not enter onto CPKC's right-of-way or perform work above the operating tracks except under the guidance of a CPKC flagperson unless otherwise agreed to by CPKC. All work undertaken by the Contractor within or above the CPKC right-of-way shall conform to CPKC's requirements as spelt out in the following documents included in the appendices:

(i) Flagging Protection Protocol.

(ii) Flagging Application Form.

(iii) Geotechnical Protocol – Utility Installation.

(iv) Utility Application Form

(v) Guidelines for Excavations on CPR Property.

(vi) Minimum Safety Requirements For Contractors Working on CP property in Canada

i. The Contractor before being allowed onto CPKC property will need to have initialed all pages and returned a copy of the Minimum Safety Requirements for Contractors to CPKC.

(vii) Operational Constraint For Work On, Above Or Below Railway Right Of Way.

(viii) Overtime Policy For All Canadian Engineering Services Employees.

(ix) Clearance Diagram – Proposed Overhead Structures Clearances for New Construction

E41.12 Utilities and CPKC Locates

(a) The Contractor shall contact the CPKC's "Call Before you Dig" number (1-800-387-1833) for all CPKC signals locates prior to undertaking any work on CPKC property.

(i) Identify location as CPKC Mile 122.4 Keewatin Subdivision

(b) Utilities on CPKC property must be protected at all times; this includes fibre optic cable along the CPKC's right-of-way.

(c) The Contractor shall provide notice to and obtain consents from owners of Utility Works (including Third Party Fibre Systems) who may be affected by the Work, including those Utility owners who are required to give consents to protect or relocate such utilities.

E41.13 Design Codes and Guidelines

(a) AREMA (American Railway Engineering and Maintenance-Of-Way Association) manual for railway engineering.

(b) CSA S6, CHBDC (Canadian Highway Bridge Design Code).

(c) Requirements for the Design of Steel and Concrete Bridges Carrying Railway Traffic in Canada.

E41.14 Scope of Work

(a) The Work under this Specification shall include:

(i) Preparation of the Construction Plan for working near and over/within the CPKC ROW to complete the Work. The Work includes Supply and Installation of a Chain Link fence along CPKC property line as show in the contract documents, as well, as Supply and Installation of a Chain Link Gate for access to CPKC ROW from Concordia Avenue.

E41.15 Submittals

(a) The Contractor shall prepare and submit a Construction Plan for all works required within, over or within 25' (7.6m) of the CPKC ROW. The Construction Plan shall address, but not limited to, the following:

(i) CPKC requirements noted within this E41.

(ii) Overall site plan indicating extents of temporary fencing, proposed temporary crossing location, staging areas, material handling areas, delivery areas, laydown areas, and temporary site facilities.

(iii) Methods of removing the existing concrete deck above the rail lines.

(iv) Bridge deck debris protection system and proposed installation method.

(v) Methods and access for temporary jacking and/or shoring

(vi) Methods to protect the existing track during deck removal

(vii) Methods and access for girder strengthening works

(viii) Methods and access for pier rehabilitation works

(ix) Methods and access for bearing replacement works

(x) Methods and access for ditch works

(xi) Methods and access for culvert works

(xii) Methods and access for Chain Link fence installation

(xiii) CPKC Temporary Crossing Application

(xiv) Proposed pier scaffolding and dimensions.

(xv) Methods of installation, access for installation, drawing showing dimensions from track centrelines to proposed scaffolding system.

(xvi) Proposed schedule indicating all work activities subject to either flagging protection and/or Track Blocks.

(xvii) Proposed equipment and machines that will be within 25' (7.6m) of the ROW or within ROW.

(xviii) Railway traffic block application for girder raising, bearing replacement and lowering, girder strengthening, including 15 minute increment schedule. Completed CPKC – 2025 Flagging Application Form required for Track Block request as well as flagging.

(xix) Methods and equipment required to remove existing slope paving.

(xx) Methods and equipment required to construct drainage swale through the bridge area

(b) CPKC – 2025 Flagging Application Form

(c) Safety Plan.

(d) Entry into or work within and around CPKC ROW cannot occur until CPKC has approved the Construction Plan and received all submittals.

(e) Construction Plans can be prepared and submitted per structure.

(f) The Contractor shall submit the CPKC Construction Plan to the Contract Administrator within twenty (20) calendar days of contract award. When the Contract Administrator deems the submission suitable for CPKC review, the Contract Administrator will submit it to CPKC. It is anticipated that CPKC will take forty (40) calendar days for submission review and acceptance. Delays to the overall project schedule based on CPKC submission review shall be at the discretion of the Contract Administrator.

MEASUREMENT AND PAYMENT

E41.16 Rail will be considered incidental to the Work. No separate measurement or payment shall be made for the work associated with this Specification.

ROAD WORKS

E42. COMPOSITE EXCAVATION

DESCRIPTION

E42.1 This Special Provision supplements CW 3170 – Earthwork and Grading by clarifying the measurement and payment method for Composite Excavation for embankment widening. This provision provides additional details for measurement and payment to ensure consistency and eliminate ambiguities in excavation classification.

MEASUREMENT AND PAYMENT

E42.2 Further to CW 3170.12, the following additional requirements apply:

E42.2.1 Measurement Method

(a) Excavation volumes shall be determined based on in-place material by comparing the pre-construction survey (after topsoil is stripped) with the post-construction survey of the completed embankment widening.

(b) Measurement shall be computed using the Average End Area method, as per CW 3170.12.1.

(c) This approach eliminates the need to differentiate between site-sourced and imported fill materials, allowing contractors to source material as needed while maintaining project specifications.

(d) All fill material required for embankment widening shall be included in the volume calculations, whether sourced from on-site excavation or imported.

E42.2.2 Payment

(a) Further to CW 3170.13.2, payment for Composite Excavation shall be made at the unit price bid per cubic meter (m^3).

(b) The unit price shall be full compensation for all excavation, transport, placement, and compaction of fill material, including:

(i) Scarification and preparation of the existing surface.

(ii) Placement and compaction of suitable fill material (whether site-sourced or imported).

(iii) Bench cuts where required to achieve embankment stability.

(iv) Demolishing the high-mast light concrete base and existing overhead sign structure concrete base as specified on the Drawings.

(c) The contractor shall ensure all placed fill meets the minimum compaction requirement of 95% Standard Proctor Density (ASTM D698).

(d) No separate payment shall be made for imported material, as it is incidental to the Composite Excavation item.

E42.2.3 Waste Excavation (Separate Pay Item)

(a) Further to CW 3170.13.1, unsuitable fill shall be paid as Waste Excavation.

(b) Waste material shall be removed and disposed of off-site at a contractor-provided location unless otherwise specified.

(c) Any material deemed unsuitable for embankment widening shall be identified by the Contract Administrator prior to placement.

CONTRACTOR RESPONSIBILITIES

E42.3 Further to CW 3170.9, the following additional requirements apply:

(a) All excavation shall be graded and compacted in accordance with CW 3170.9.

(b) The contractor shall coordinate with the Contract Administrator regarding:

(i) The final placement of embankment material.

(ii) The identification and handling of unsuitable excavation materials.

QUALITY CONTROL & INSPECTION

E42.4 Further to CW 3170.10, the following additional requirements apply:

(a) The Contract Administrator will verify the volume of excavation using survey data.

(b) Field density tests shall be conducted to ensure compaction requirements are met.

(c) The contractor shall notify the Contract Administrator before placing fill to allow for inspection of the prepared subgrade.

BASIS OF PAYMENT

E42.5 Payment will be made under the following pay item(s):

Item No.	Description	Unit
E42	Composite Excavation (Embankment Widening)	m^3
E42	Waste Excavation (Unsuitable Material)	m^3

E42.6 No separate payment will be made for scarification, benching, hauling, or compaction, demolishing the high-mast street light concrete base and existing overhead sign structure concrete base as these are incidental to composite excavation.

E43. HYDRO EXCAVATION

E43.1 Description

E43.1.1 This Specification shall cover the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the recovery of excavated material by vacuum type means or equivalent method as approved by the Contract Administrator.

E43.2 Materials

E43.2.1 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.

E43.3 Equipment

E43.3.1 General

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

E43.4 Construction Methods

E43.4.1 Hydro-Removal of Earthen Material

(a) The Contractor shall only be compensated for hydro-excavation undertaken with prior permission of the Contract Administrator. The Contractor shall only be compensated for hydro-excavation required to locate utilities relating to the pathway along Lagimodiere Boulevard and Almey Avenue. Hydro-excavation required to expose utilities at all other locations shall not be compensated and shall be considered incidental to the Work.

(b) Earthen material adjacent to utility entity shall be sprayed with high pressure water so as to remove all such material identified by the Contract Administrator. Expose the buried utility by using a sweeping motion only, perpendicular to the locate markings, until the line is sighted. After sighting, the line shall not be contacted by spray or vacuum to avoid damage.

(c) Maximum settings when excavating within 1 m of marked utilities will be 38°C (100°F) temperature and 10,342 kPa (1500 psi) pressure.

E43.4.2 Recovery of Excavated Material

(a) The recovery of excavated material shall be done using a vacuum type method, or other type method as approved by the Contract Administrator.

(b) The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filing with excavated material.

(c) The use of mechanical sweepers will not be allowed.

(d) Dispose of material in accordance with Section 3.4 or CW 1130-R1.

E43.4.3 Backfill of Hydro Excavated Material

(a) The Contractor shall be responsible for the backfill of the hydro excavated hole upon acceptance of the Work described herein by the Contract Administrator.

E43.5 Quality Control and Assurance

E43.5.1 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.

E43.5.2 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.

E43.6 Measurement and Payment

E43.6.1 Hydro-Excavation

(a) Hydro-Excavation of earthen material and its recovery and disposal as well as backfilling the hole will be measured on an hourly basis and paid for at the Contract Unit Price per hour for “Hydro-Excavation”. The hours to be paid for will be the total number of hours of hydro-excavation completed in accordance with this Specification, accepted and measured by the Contract Administrator.

(b) The hours to be paid for “Hydro-Excavation” shall be measured as the time spent on-site by the required equipment and shall be approved daily by the Contract Administrator.

E44. PORTABLE PRECAST CONCRETE BARRIERS AND TEMPORARY CRASH ATTENUATORS

DESCRIPTION

E44.1 This Special Provision supplements CW 1130 – Site Requirements by clarifying requirements for Portable Precast Concrete Barriers (PPCB), Temporary Crash Attenuators, and Sand Barrels that are not explicitly covered in CW 1130. This provision applies only where these specific traffic control elements are required by contract documents or directed by the Contract Administrator.

E44.2 Further to CW 1130.3.7 – Traffic Control, the following additional requirements apply:

E44.2.1 PPCB Handling and Installation:

(a) The Contractor shall pick up PPCBs from the designated City Yard, transport them to the site, install them per the contract drawings, and return them to the City Yard upon project completion.

(b) Concordia Avenue PPCBs

(i) As per the Traffic Management Plans, the Contractor shall pickup, install, adjust, and return to the City Yard all PPCBs necessary to complete the works.

(ii) Any PPCBs not required during any period, including but not limited to seasonal shutdowns, shall be removed and stored.

(c) Lagimodiere Boulevard PPCBs

(i) As per the Traffic Management Plans, the Contractor shall pickup, install, adjust, and return to the City Yard all PPCBs necessary to complete the works.

(ii) Any PPCBs not required during any period, including but not limited to seasonal shutdowns, shall be removed and stored.

(iii) PPCBs has been placed at the north end of the northbound bridge (inner shoulder) by Others during Tender No. 294-2025 (Temporary Pavement Works). The Contractor shall relocate these PPCBs to the southerly end of the southbound bridge prior to the initiation of Stage 2 construction. Once Stage 2 is complete these barriers shall be returned to the City Yard.

(d) PPCBs shall be installed in accordance with manufacturer specifications, project safety requirements, and as shown on the Drawings.

(e) The Contractor shall ensure barriers are properly aligned, anchored (if required), and maintained throughout the project duration.

E44.2.2 Measurement and Payment:

(a) PPCBs shall be paid per unit (3m section), which includes transportation, placement, relocation as shown on the Drawings, removal and return to the designated City Yard.

(b) No additional payment shall be made for minor adjustments to barrier positioning as directed by the Contract Administrator.

CRASH ATTENUATORS

E44.3 Further to CW 1130.3.7 – Traffic Control, the following additional requirements apply:

E44.3.1 Installation and Approval:

(a) Crash Attenuators shall be placed in accordance with the manufacturer's specifications and the contract drawings.

(b) The Contractor shall submit a proposed unit for approval by the Contract Administrator before procurement and installation.

(c) The Contractor shall ensure that attenuators remain functional and undamaged for the duration of the project.

E44.3.2 Measurement and Payment:

(a) Crash Attenuators shall not be paid directly but rather considered incidental to the Work. This includes transportation, placement, relocation as shown on the Drawings, and removal.

(b) No separate payment shall be made for maintenance, unless replacement is required due to factors beyond the Contractor's control.

E45. SHOULDER PREPARATION AND GRANULAR BASE C LIMESTONE PLACEMENT

DESCRIPTION

E45.1 This Special Provision modifies and supplements CW 3110 by clarifying requirements for:

(a) Shoulder preparation before placing new base material.

(b) Use of Granular C Limestone for shoulder rehabilitation.

(c) Scarification and grading procedures to ensure stability.

(d) Compaction requirements for both existing and new material.

(e) Measurement and payment methods, ensuring shoulder preparation is incidental to grading, with payment only for new material placement.

MATERIAL REQUIREMENTS

E45.2 Further to CW 3110.2, the following shall apply:

(a) Granular C Limestone shall be used as the base material for all shoulders requiring rehabilitation.

(b) The material shall conform to CW 3110.2 Base Course materials gradation and physical requirements.

(c) No substitutions (Granular A or B) shall be permitted unless explicitly approved by the Contract Administrator.

SHOULDER PREPARATION AND PLACEMENT PROCEDURE

E45.3 Further to CW 3110.3, the following shall apply:

E45.3.1 Scarification and Regrading

(a) For material additions of 75mm or more:

(i) Scarify the existing shoulder to a depth of 50-75mm to create a uniform bonding surface.

(ii) Remove all loose material, debris, and contaminants.

(iii) Grade and shape the scarified area to match the desired cross-slope before placing new material.

(iv) Compact the scarified area before adding new material.

(b) For material additions of less than 75mm:

(i) No scarification is required.

(ii) The existing shoulder should be graded and compacted before new material is placed.

E45.3.2 Placement of Granular C Limestone

(a) Further to CW 3110.3.6, a minimum 100mm layer of Granular C Limestone shall be placed.

(b) If final thickness is greater than 100mm, placement shall be done in lifts of no more than 75mm per layer.

(c) The final surface shall be graded to a uniform cross-slope before compaction.

E45.3.3 Compaction Requirements

(a) Further to CW 3110.3.8, scarified areas must be compacted before placing new material.

(b) New material shall be compacted to 100% Standard Proctor Maximum Dry Density as per CW 3110.3.8.

(c) If water is required for compaction, it shall be applied uniformly to prevent segregation.

MEASUREMENT AND PAYMENT

E45.4 Further to CW 3110.6, the following shall apply:

(a) Shoulder preparation (scarification, regrading, and initial compaction) is incidental to the grading work and shall not be measured separately.

(b) Only the supply and placement of new Granular C Limestone will be measured and paid per tonne as per CW 3110.6.7 – Base Course Material.

(c) Excess excavated material from the shoulder shall be removed at the contractor’s expense, unless directed otherwise.

E46. GRANULAR RIB CONSTRUCTION

DESCRIPTION

E46.1 General

E46.1.1 The Work covered under this item shall include all items relating to the construction of Granular Ribs, as shown on the Drawings.

E46.1.2 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.

E46.2 Scope of Work

E46.2.1 The scope of this Work is not necessarily confined to the following, which is compiled as a general outline:

(a) Excavation;

(b) Supply and placement of all backfill materials;

(c) Supply and compaction of 200 mm of clay cap;

MATERIALS

E46.3 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 testing 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 Contractor shall supply all materials incidental to these Works. All materials must be on hand prior to commencement of the Work.

E46.4 Aggregate

(a) Rockfill for Granular Ribs

(i) Backfill for granular ribs shall consist of sound, dense, durable crushed limestone. The material shall be free from organics, roots, silt, clay, snow, ice or any other deleterious material.

(ii) Backfill for granular ribs shall consist of 100 mm limestone down in accordance with Clause 2.1 of CW 3110 (latest edition) with the following modifications:

a. Parameter Test Method Specified Limit

b. Bulk Specific Gravity ASTM C127 2.6 minimum

c. LA Abrasion ASTM C131 35% maximum

d. Soundness ASTM C88 13% maximum

E46.5 Clay cap shall be as per City specification CW 3170, Clause 5.

CONSTRUCTION METHODS

E46.6 Compaction Testing Program

(a) The Contractor shall carry out a Compaction Testing Program to facilitate quality control during construction. This program shall be carried out to demonstrate that the means, methods and techniques of compaction proposed by the Contractor are consistent with achieving the degree of compaction specified.

(b) The Contractor shall provide all necessary labour, material and equipment necessary to carry out the compaction testing program. All testing shall be carried out in the presence of the Contract Administrator. Minimum requirements for the testing program will include:

(i) The first granular rib shall be used as a test trench. Additional test trenches (if required) shall be located immediately adjacent to completed test trenches. The test trench shall be excavated to the lines and grades shown on the drawings and backfilled as noted herein.

(ii) Placement of the backfill material shall be in maximum lift thicknesses (prior to compaction) of 400 mm, if compacted using a hoe-pack. If a direct-insertion vibratory probe will be used for compaction, the trench may be backfilled in full prior to compaction. The equipment to be used shall be subject to review and acceptance by the Contractor Administrator.

(iii) Compaction of the backfill in the manner proposed for construction to achieve a maximum apparent field density. The degree of compaction will be determined by measurement of the volume of backfill material before and after compaction.

(iv) Such other testing as necessary to demonstrate that the Contractor's proposed means, method(s), techniques and equipment are consistent with achieving the specified degree of compaction during construction.

(c) As a result of the Compaction Testing Program, the Contractor must establish the following:

(i) the compaction equipment proposed for use;

(ii) the protocol for operations;

(iii) degree of compactive effort required.

(d) No construction of granular ribs shall commence until the Contractor has demonstrated through the Compaction Testing Program that the proposed methods of compaction will meet the specified requirement for each portion of the works. Acceptance of the Compaction Testing Program shall in no way relieve the Contractor from his contractual obligation of achieving the specified degree of compaction during construction.

E46.7 Granular Rib Construction

(a) The Contractor shall monitor his compaction operations during construction to ensure the compaction methods selected based on the Compaction Testing Program are consistently achieving the specified results.

(b) The Contractor shall advise the Contract Administrator of any modifications to his proposed methods that are required if the required degree of compaction is not being achieved.

E46.8 Excavation

(a) The excavation for each rib shall be a width of 1.5 metres and shall extend to the lines and grades shown on the drawings. The excavation for sideslopes shall be cut as near vertical as possible. Any deleterious or sloughed material at the base of the excavation or during backfilling shall be removed prior to further backfilling.

(b) The Contractor shall maintain a dry excavation and will be required to take the necessary corrective actions to prevent water from entering or accumulating in the excavation.

E46.9 Backfilling and Compaction

(a) Backfilling of each granular rib shall commence immediately after excavation has been completed and shall not be left open. Excavation of adjacent ribs will not be permitted until backfilling of the excavated rib is complete.

(b) Backfilling and compaction shall proceed following the protocol determined in the Compaction Testing Program.

(c) Care shall be taken to prevent contamination of the crushed limestone backfill. Should contamination of the backfill occur, the affected backfill shall be removed and disposed as directed by the Contract Administrator and will be incidental to the Works.

E46.10 Compaction Testing Program

(a) The Compaction Testing Program shall be incidental to Granular Rib construction.

MEASUREMENT AND PAYMENT

E46.11 Granular Rib Construction

(a) The supplying and placing of crushed limestone backfill for granular rib construction, and also the trial rib construction will be measured and paid for at the contract lump sum price for “Granular Rib Construction”. The crushed limestone backfill material shall be supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

(b) No separate measurement and payment will be made for the excavation and disposal of soil or contaminated backfill material from the rib trenches. Excavation and disposal of soil and or contaminated backfill material will be considered incidental to the contract.

(c) No separate measurement and payment will be made for the compaction of granular rib backfill. All backfill compaction will be considered incidental to the contract.

(d) No separate measurement and payment will be made for the supply and placement of 200 mm clay cap and shall be incidental to “Granular Rib Construction”.

E47. EROSION CONTROL BLANKET (ECB)

DESCRIPTION

E47.1 General

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

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

E47.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revisions:

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

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

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

(iv) ASTM D6818 – Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products;

(v) Erosion Control Technology Council (ECTC) Guidelines;

E47.3 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:

(i) Supplying and installing erosion control blanket on disturbed slopes of the embankments;

(ii) 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;

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

E47.4 Submittals

(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.

(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 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.

MATERIALS

E47.5 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.

E47.6 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.

E47.7 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 B6 “Substitutes.”

(b) Erosion control blankets shall conform to Class 2 – Medium Life rolled erosion control products, as listed in the current MTI Approved Products List for Erosion Control Blankets.

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

(d) 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 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.

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

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

(ii) Topside netting: heavyweight photodegradable with UV additives (1.47 kg/100 m²);

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

(iv) Thread: degradable.

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

EQUIPMENT

E47.8 General

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

CONSTRUCTION METHODS

E47.9 General

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

(b) The Contractor shall coordinate wattle activities with the referenced Specifications noted in E50 “Straw Wattles”.

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

E47.10 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 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 be 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 his 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 his own cost.

E47.10.1 Erosion Control Blanket in Ditches

(a) Where erosion control blanket is installed in ditches, the blanket shall be placed along the direction of flow and keyed into the base of the ditch and side slopes at all terminal ends and intermediate check slots. Overlaps shall occur downstream and be secured at a minimum of 300 mm with staples, spaced as per Manufacturer’s recommendations.

E47.10.2 Complying with Environmental Protection Requirements

(a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Red River 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.”

(b) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include the 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, and repair all sediment control measures until vegetation has re-established in restored areas and there is no longer 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.

QUALITY CONTROL AND ASSURANCE

E47.11 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.

MEASUREMENT AND PAYMENT

E47.12 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.

(b) Supplying and installing erosion control blanket associated with Landscaping will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Supply and Install Erosion Control Blanket,” 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.

E48. ASPHALT PAVEMENT

DESCRIPTION

E48.1 General

(a) This specification covers the requirements for the materials, equipment, and processes for proportioning and mixing hot mix asphalt (HMA) including warm mix asphalt (WMA), recycled mixes, and mixes for miscellaneous work in accordance with the Marshall and Superpave methods.

(b) This Specification covers the preparation of hot/warm-mixed, hot/warm--laid, asphalt paving mixes for, and all placing operations relating to, the construction of asphalt pavements, overlays and other related pavement works.

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

E48.2 Definitions

(a) Hot Mix Asphalt (HMA) means hot mixed, hot laid asphalt. The terms are used interchangeably. HMA may include recycled or specialty mixes.

(b) Warm Mix Asphalt (WMA) means warm mixed, warm laid asphalt produced using technologies that allow for the mixing, handling, and compaction of the asphalt concrete mixture at a temperature typically lower than conventional hot mix asphalt.

(c) Lift means the compacted thickness of asphalt material laid in a single application.

(d) Base Course means the layer of material between the sub-base and the pavement wearing surface.

(e) SP1 means dense-graded asphalt mix using Superpave mix design for surface course. SP1 is intended for the reconstruction and asphalt overlay of expressways, major arterials, and minor arterials, reconstruction of industrial/commercial collectors and associated approaches as well as the paving of bridge decks.

(f) SP2 means dense-graded asphalt mix using Superpave mix design for intermediate and bottom lifts. SP2 is intended for the reconstruction of high traffic volume streets, including expressways, major arterials, minor arterials, industrial/commercial collectors and associated approaches as well as the paving of bridge decks.

(g) MS1 means dense-graded asphalt mix using Marshall mix design for surface course. MS1 is intended for the reconstruction and asphalt overlay of intermediate and low volume streets including residential major or minor collectors, residential local, public lanes, asphalt pathways and associated approaches.

(h) MS2 means dense-graded asphalt mix using Marshall mix design for intermediate and bottom lifts. MS2 is intended for intermediate and low volume streets including residential major or minor collectors, residential local, public lanes, asphalt pathways and associated approaches.

(i) Reclaimed asphalt pavement (RAP) means the processed HMA or WMA material that is recovered by partial or full depth removal.

(j) Deleterious Material means soft or friable material that would decay or disintegrate from weathering including ironstone, porcelain, vegetation, organic material, wood, glass, alkali, plastic, metal, reinforcing steel, building rubble, brick, shale, mica, coal, clay lumps, and loam or other deleterious substances.

(k) Job-Mix Formula (JMF) means the percentage passing on each designated sieve of the total mass of aggregate and the amount of asphalt cement as a percentage by mass of the mixture that are based on specified mix design procedures, and when mixed results in a paving mixture in accordance with this specification.

(l) Mix Design means the design of the proportions of aggregates, asphalt cement, and additives that when uniformly mixed results in an acceptable asphalt mix in accordance with the specified method.

(m) Performance Graded Asphalt Cement (PGAC) means an asphalt binder that is asphalt-based cement produced from petroleum residue, either with or without the addition of non-particulate modifiers, in accordance with AASHTO M320.

(n) Superpave means the method for specifying material components and asphalt mix design using the Superpave Gyratory Compactor (SGC).

(o) Joint means a vertical contact between a new asphalt pavement course and any existing asphalt pavement or any rigid object that exists at the time the HMA is laid.

(p) Prime Coat means application of emulsified asphalt cement on a Base Course granular surface.

(q) Tack Coat means application of emulsified asphalt cement on existing asphalt or portland cement concrete pavement prior to overlay, or between layers of new bituminous pavement.

(r) Prime/Tack Coat Cure means the moment when water separates enough from the emulsified asphalt to show a color change from brown to black.

(s) Segregation means a condition of the pavement characterized by areas with comparatively coarser texture than that of the surrounding pavement.

(t) Lot means a specific quantity of material, approximately 150 tonnes or less, from a single source and produced by the same process within a single operational day. Actual size of Lot may vary based on scaled quantities delivered to the road.

(u) Echelon Paving is a modern method used in road construction that significantly improves the quality and durability of asphalt surfaces. This technique involves two pavers operating in tandem, with one paver slightly staggered behind the other. This arrangement allows for the longitudinal joint—the seam where two lanes of asphalt meet—to be compacted simultaneously, resulting in a nearly undetectable joint.

MATERIALS

E48.3 Handling and Storage of Materials

(a) All asphalt constituent materials shall be stored in a manner that will prevent contamination or deterioration. Access to the storage facilities shall be provided for inspection by the Contract Administrator.

(b) All fabricated and incidental materials, such as anti-stripping, prime coat, tack coat, etc., shall be stored in accordance with the manufacturer's instructions.

(c) The Contract Administrator shall approve all materials before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to this Specification 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. There shall be no charge to the City for any materials taken for testing purposes.

E48.4 Aggregate

E48.4.1 Aggregate shall consist of crushed stone or gravel or a combination of these materials conforming to the requirements of this Specification.

(a) Each of the fine- and coarse-fractions of the combined aggregate shall meet all the requirements of this Specification and shall be handled and weighed separately to maintain uniformity. The supplier shall provide the City of Winnipeg, Research and Standards Engineer with test data demonstrating that the material will produce asphalt mixes of acceptable quality that meet all the requirements of this Specification.

(b) Aggregates shall be hard and durable fragments with a maximum of 2% deleterious materials in both coarse and fine aggregates in accordance with ASTM Standard C142, Standard Test Method for Clay Lumps and Friable Particles in Aggregate and ASTM C123/C123M - Standard Test Method for Lightweight Particles in Aggregate by Washing as well as visual inspection of aggregates to identify deleterious materials.

(c) The combined aggregate gradation and physical properties shall comply with the requirements in Table E48.1.

Table E48.1: Combined Aggregate Gradation and Physical Properties Limits

	Test Method	**SP1**	**SP2**	**MS 1**	**MS 2**
Sieve Size, mm		Percent of Total Dry Weight Passing Each Sieve			
19.0	ASTMC 136 or ASTM D5444 (Note 1)	--	100%	--	100%
16.0		100%	90% - 100%	100%	90% - 100%
12.5		90% - 100%	70% - 90%	90% - 100%	75% - 95%
9.5		75% - 90%	60% - 80%	75% - 90%	70% - 90%
4.75		48% - 70%	40% - 62%	48% - 70%	55% - 70%
2.36		28% - 58%	23% - 50%	28% - 58%	35% - 55%
1.18		19% - 40%	15% - 35%	19% - 40%	28% - 46%
0.60		13% - 30%	10% - 22%	13% - 30%	17% - 32%
0.15		4% - 15%	4% - 14%	4% - 15%	4% - 12%

	Test Method	SP1	SP2	MS 1	MS 2
Sieve Size, mm		Percent of Total Dry Weight Passing Each Sieve			
0.075		2% - 8%	2% - 8%	2% - 8%	3% - 10%
Fine Aggregate Angularity, %min (Note 2)	ASTM C1252 – Method A	45%	45%	40%	40%
Clay Content (Sand Equivalency), %min (Note 3)	ASTM D2419	45%	45%	45%	40%
Crush Count, %min (2 Fractured Faces) (Note 4)	ASTM D5821	95%	80%	80%	80%
Flat and Elongated Particles, % Max	ASTM D4791	6%	10%	--	--
Absorption, %max	ASTM C127	2%	2%	2%	2%
Abrasion, %max (Note 4)	ASTM C131	35%	35%	35%	40%
Micro-Deval, %max (Note 4)	ASTM D6928	15%	15%	15%	17%
Soundness (Note 5)	ASTM C88	Note 3	Note 3	Note 3	--
Lightweight Particles Content, %max (Note 6)	ASTM C123	3%	5%	3%	5%

- Note 1: ASTM C136 shall be used for determining the particle size distribution of fine and coarse virgin aggregates while ASTM D5444 shall be used for determining the particle size distribution of extracted aggregates from bituminous mixtures.
- Note 2: Test criteria shall apply for fine aggregates passing 4.75mm sieve. Test results shall be based on combined aggregates prior to the addition of RAP. Fine Aggregate Angularity (FAA) of 43% is acceptable, provided the mix complies with all other specified requirements.
- Note 3: Test results shall be conducted on the combined aggregate mix before the addition of Reclaimed Asphalt Pavement (RAP).
- Note 4: Test criteria shall apply for coarse aggregates retained on 4.75 mm sieve.
- Note 5: Soundness - Coarse aggregate when subjected to five cycles of the soundness test shall have a weighted loss of not more than twelve (12) percent when sodium sulphate is used or not more than eighteen (18) percent when magnesium sulphate is used in accordance with ASTM Standard C88, Test for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- Note 6: The lightweight particle content is the percentage of lightweight particles by weight of all particles retained on 4.75mm sieve.

(d) Quarried limestone and dolomite shall not be acceptable as asphalt aggregate materials for SP1 and MS1 surface lifts.

E48.5 Asphalt Cement

E48.5.1 Asphalt cement shall be performance graded asphalt cement in accordance with AASHTO M 320 unless otherwise specified in the Contract Documents.

(a) Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:

https://legacy.winnipeg.ca/matmgt/spec/default.stm

E48.5.2 The PGAC shall be homogeneous, free of water and any contamination, and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product. It shall be shipped, used, and always handled in accordance with the manufacturer's specifications.

E48.5.3 All PGAC shall be in accordance with AASHTO M 320 when tested using the methods designated in AASHTO R29, Test Procedure for Grading an Unknown Asphalt Binder and continuous grading temperatures and reported continuous grading temperatures rounded to the nearest 0.1 °C.

E48.5.4 Grades shall be tested at a temperature of 58 °C to determine the average percent recovery at 3.2 kPa (R3.2) in accordance with the requirements of AASHTO T350 Multiple Stress Creep Recovery (MSCR) Test using a Dynamic Shear Rheometer. The minimum MSCR Elastic Recovery shall be 25%.

E48.5.5 The PGAC performance grading test result requirements shall be

(a) Equal to or above XX* and equal to or below -YY*; or

(b) ≤ 0.5 °C below XX and ≤ 0.5 °C above -YY

Where *XX is the specified high temperature performance grade and design maximum pavement temperature and -YY is the specified low temperature performance grade and design minimum pavement temperature.

E48.5.6 The PGAC shall comply with the performance grading requirements in Table E48.2

Table E48.2: Categories for PGAC

Asphalt Type		Specified Standard Grade*
Top lift	SP1	PG 64-34P
	MS1	PG 58-34P
Other lifts	SP2	PG 58-34P
	MS2	PG 58-34P

E48.6 Mineral Filler

(a) Mineral filler, when required, shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, loess or other suitable mineral matter, and shall conform to the requirements of ASTM Standard D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures. Mineral filler shall be free from organic matter and shall be non-plastic when tested in accordance with ASTM D2974 Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils

E48.7 Incidental Materials

E48.7.1 Prime Coat

(a) Prime coat shall consist of an emulsified asphalt. Method of application shall conform to the manufacturer's recommenda-tions.

(b) Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:

https://legacy.winnipeg.ca/matmgt/spec/default.stm

E48.7.2 Tack Coat

(a) Tack coat shall consist of emulsified asphalt. Method of application shall conform to the manufacturer's recommenda-tions.

(b) Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:

https://legacy.winnipeg.ca/matmgt/spec/default.stm

E48.7.3 Reclaimed Asphalt Pavement (RAP)

(a) Reclaimed asphalt pavement shall consist of sound durable particles produced by crushing and screening.

(b) RAP is not permitted in SP1 where used as a surface course. Up to 10% by mass of RAP is permitted where SP1 is used in lifts other than surface course.

(c) Up to 10% by mass of RAP is permitted in MS1 where used as a surface course.

(d) Up to 15% by mass of RAP is permitted in MS1, MS2, and SP2 where used in lifts other than surface course.

(e) RAP shall be blended during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

(f) All physical requirements and combined aggregate gradation limits shall meet the requirements of Table 51.1.

E48.7.4 Recycled Asphalt Shingles (RAS)

(a) RAS shall be blended during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

(i) RAS shall consist of sound durable particles produced from recovered organic asphalt, shingles, asphalt caps and asphalt rolled roofing. Fiberglass shingles are not permitted.

(ii) RAS material can be incorporated to a maximum 3% by weight of the total mix into MS1, MS2, and SP2 where used in lifts other than surface course.

(iii) RAS particles shall be a maximum size of 10mm and shall otherwise meet the gradation requirements in Table E48.1.

(iv) RAS shall be free of chemical contaminants. Deleterious substances shall be a maximum of 3% of RAS by weight. Deleterious substances include fiberglass shingles, metal, glass, rubber, nails, soil, brick, tars and asbestos.

DESIGN REQUIREMENTS FOR ASPHALT PAVING MIX

E48.8 Testing Laboratories

(a) The City of Winnipeg, Research and Standards Engineer will maintain a list of approved Testing Laboratories. To obtain approval, Testing Laboratories must submit the following information to the Research and Standards Engineer annually prior to April 1st:

(i) Valid Category “B” Asphalt laboratory certification or higher by Canadian Council of Independent Laboratories (CCIL);

(ii) A complete list of the certified testing; and,

(iii) List of the field personnel and their qualifications.

E48.9 Asphalt Suppliers

E48.9.1 Asphalt suppliers must submit the following information to the Research and Standards Engineer three weeks prior to paving:

(a) Asphalt suppliers Approval Guidelines and Application is available at the City of Winnipeg, Corporate Finance, Material Management Division website at;

https://legacy.winnipeg.ca/matmgt/spec/default.stm

(b) Names of suppliers and sources for all materials and admixtures;

(c) Asphalt mix designs. The mix design shall be completed by an approved laboratory with CCIL Type “A” certification based on the asphalt type;

(d) Copies of valid scale calibration reports for the asphalt batch plant;

(e) Test data for aggregates (in accordance with Clause 2.2);

(f) Sieve analysis test reports for the individual aggregates and the combined aggregate gradations to be used in the asphalt. The sieve analysis test reports shall be representative of the material to be used during asphalt production;

(g) Test data for asphalt cement (in accordance with Clause 2.3) and the following items shall be submitted:

(i) The PGAC supplier and location that the product shall be supplied from;

(ii) All documentation from the PGAC supplier confirming the grade of PGAC;

(iii) Applicable mixing and compaction temperatures for the product;

(iv) The minimum temperature of the mix immediately after spreading as recommended by the PGAC supplier; and,

(v) Documentation of construction, storage, and handling requirements, including the material safety data sheet, recompaction temperature, and mix discharge temperature.

(h) Performance data from trial batches prior to construction to demonstrate the asphalt mix will achieve the performance criteria in Table E48.4 and Table E48.5. Three (3) separate sets of test results from a trial batch will be required for approval of the corrected mix design statement;

(i) Quality control program for all materials, including a proposed sampling and testing plan in accordance with Clause 3.4;

(j) The supplier shall hold a valid development license issued in accordance with the Manitoba Environment Act for the operation of the Bituminous Mix plant. The plant shall be located and operated in accordance with the terms and conditions of the license; and,

(k) The supplier shall control dust at the plant site in accordance with health, safety and environmental requirements.

E48.9.2 The City of Winnipeg, Research and Standards Engineer will conduct inspections at least once a year during production. Samples of materials may be taken and tested.

E48.9.3 Testing for qualification or acceptance purposes shall be done in accordance with this Specification and applicable test procedures and standard practices. There shall be no charge for any materials taken for testing purposes.

E48.9.4 Changes in the source of any asphalt constituent materials will not be permitted without approval of the City of Winnipeg, Research and Standards Engineer. For new sources, all materials shall be tested.

E48.9.5 Once approved, all asphalt shall be supplied in accordance with the approved Mix Design Statement. No changes in the asphalt mix designs will be permitted without written permission from the City of Winnipeg, Research and Standards Engineer.

E48.9.6 Any change in the constituent materials of the asphalt shall require a new asphalt mix design.

E48.9.7 No asphalt supply or placement shall proceed until the asphalt cement submittal, mix design and Job Mix Formula are approved.

E48.10 Asphalt Mix Design and Job Mix Formula

E48.10.1 The Mix Design Statements for all asphalt types shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. The mix shall be proportioned to produce asphalt in accordance with the requirements of Table E48.3 or Table E48.4.

Table E48.3: Marshall Mix Requirements

Mix Properties	MS1	MS2
Asphalt Cement, % total sample weight	5.5% to 6.5%	5.0% to 6.0%
Voids in Mineral Aggregate, %min	14%	13%
Voids Filled with Asphalt (%)	67% to 78%	67% to 75%
Air Voids	3.0% to 5.0%	3.0% to 5.0%
Marshall Stability, kN at 60°C	8 min.	8 min.
Flow Index, units of 250 µm	8.0 to 14.0	8.0 to 16.0

Note: The mix shall be designed using 75 blows per side of the test specimen with manual compaction hammer or a mechanical equivalent device.

Table E48.4: Superpave Mix Requirements

Mix Properties			SP1	SP2
% of Theoretical Maximum Specific Gravity		Mix Gyratory Compaction Requirements		
	$N_{initial}$	8	≤ 89.0	≤ 90.5
	N_{design}	100	96.0	96.0
	N_{max}	160	≤ 98.0	≤ 98.0
Voids in Mineral Aggregate, %min			14	13
Voids Filled with Asphalt, %			67 – 75	65 – 75
Dust to Binder Ratio			0.6 – 1.2	0.6 – 1.2
Minimum Tensile Strength Ratio (TSR), % (AASHTO T283)*			80%	70%

* If the specified TSR is not met, an approved anti-stripping additive shall be incorporated into the mix at a rate recommended by the anti-strip manufacturer and approved by the City of Winnipeg, Research and Standards Engineer.

E48.10.2 If, during the progress of the work, the mix design is found to be unsatisfactory for any reason or the quality assurance tests show deviation between the results and Mix Design Statement exceeding those identified in Table E48.5, the asphalt supplier shall revise the mix design(s) and submit the proposed changes to the City of Winnipeg, Research and Standards Engineer for approval. The changes shall not exceed any of the limits specified in Table E48.5 and shall meet the requirements specified in Tables E48.1, E48.2, E48.3 and E48.4 of this Specification; otherwise a new mix design shall be submitted.

Table E48.5: Maximum Deviation and Adjustments for JMF

Mix Properties	Maximum Deviation Between the QA results and Mix Design Statement, %	Maximum JMF Adjustment, %
Asphalt Cement, % total sample weight	± 0.2	± 0.3
RAP	3%	5%
Passing 16.0 mm, 12.5 mm, 9.5 mm sieves	4.0%	5.0%
Passing 4.75 mm, 2.36 mm, 1.18 mm, 0.425 mm, 0.18 sieves	2.0%	3.0%
Passing 0.075 mm sieve	1.0%	1.0%

E48.10.3 The mix design shall be valid for a maximum of twelve (12) months from when the mix design was developed. To extend use of the mix design beyond the initial twelve (12) months, a minimum of one test of each property listed in the Design Requirements section shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. A full mix design shall be submitted every three years.

E48.11 Plant Quality Control

(a) The asphalt supplier shall be responsible for quality control of the plant to ensure all materials meet the approved mix designs. This information shall be submitted monthly and will be monitored by the City of Winnipeg, Research and Standards Engineer. Failure to submit the quality control results shall be cause for immediate suspension of the asphalt supplier.

(b) Quality Control testing shall be conducted by a laboratory certified in accordance with the requirements in E48.8 and approved by the City of Winnipeg, Research and Standards Engineer.

(c) The quality control program shall include all testing in accordance with the sections of materials and design requirements of this Specification. A minimum of one test for aggregate gradation and asphalt materials shall be provided monthly during production.

(d) Testing of any asphalt constituent materials may be undertaken by a testing laboratory designated by the City of Winnipeg, Research and Standards Engineer. The asphalt supplier shall be equipped with suitable means or a device for obtaining a representative sample of the asphalt cement. Any material which fails to comply with the requirements of this specification will be rejected. Material that has been rejected must be removed immediately by the asphalt supplier.

SUPPLY OF MATERIALS

E48.12 General

All asphalt suppliers shall be approved by the City of Winnipeg, Research and Standards Engineer. A list of approved asphalt suppliers is available at the City of Winnipeg, Corporate Finance, Material Management Division website at: https://legacy.winnipeg.ca/matmgt/spec/default.stm

(a) Unless otherwise specified, only use of stationary asphalt mixing plants will be permitted.

E48.13 Aggregate

(a) The different sizes of aggregate used shall be kept separate and adequate provision shall be made to keep them from becoming mixed or otherwise contaminated.

(b) Where blending of materials from one or more sources and/or sizes, each material shall be placed in separate stockpiles.

(c) Separate aggregate feeds capable of delivering a uniform flow of material to the dryer shall be provided for each separate stockpile of aggregate, RAP, supplementary material and VMA additive used to produce the asphalt mix.

(d) The aggregates shall be dried at a minimum temperature of 135°C before mixing with the asphalt.

E48.14 Asphalt Cement

(a) The asphalt cement shall be heated in a storage tank to a temperature that falls within the mixing temperature range recommended by the asphalt cement manufacturer. The mixing temperature shall be based on the temperature-viscosity curve for the asphalt cement and shall be sufficient to produce a uniform and homogeneous mixture in which all particles of the aggregate are thoroughly and uniformly coated. All information related to the asphalt cement shall be made available to the Contract Administrator upon request.

(b) The asphalt cement shall be heated at the plant to a maximum tem-perature of 160°C before mixing with the aggregates. In no case shall the temperature of the asphalt and aggregates differ by more than 15°C when placed in the mixing drum.

E48.15 Transportation of Asphalt Paving Mix

(a) The mixture shall be transported from the plant to the site in trucks with metal bottoms previously cleaned of all foreign materials. If required, truck boxes shall be lightly coated with a uniform application of a non-petroleum-based asphalt release agent. The release agent shall conform to the Manufacturer's specifications and approved by the Contract Administrator. Excess lubricants shall be removed before trucks are loaded with asphalt. Release agents that adversely affect the quality or performance of the asphalt mix shall not be used.

(b) The trucks shall be suitably insulated, as required. Each vehicle shall be equipped with a tarpaulin or other suitable covering material of sufficient size to overhang the truck box on three sides when the vehicle is fully loaded. Such tarpaulins shall be on the truck at all times and shall be used to cover the mixture completely as directed by the Contract Administrator.

EQUIPMENT

E48.16 General

(a) All equipment shall be of a type approved by the Contract Administrator. The equipment shall be in good working condition for the duration of the Contract.

E48.17 Prime/Tack Coat Distributors

(a) For main lane paving, prime/tack coat shall be applied using self-propelled or tow-along pressure distributors capable of applying the product at the specified rate and in a continuous and uniform manner both longitudinally and transversely for the full lane width.

(b) The distributors shall be equipped with a volume metering system of sufficient sensitivity to measure the quantity of tack/prime coat. The metering system shall be calibrated annually and all the certifications shall be made available to the Contract Administrator upon request. The distributors shall contain a thermometer for measuring the temperature of the tank contents.

(c) All nozzles shall be set in the spray bar such that the nozzle slots make an angle between 15° to 30° with the longitudinal axis of the spray bar. Clogged nozzles shall be removed and cleaned with solvent before being used.

(d) The use of a hand-held pressure applicator is acceptable only for prime/tack coating of small or irregularly shaped areas such as cuts, approaches, etc.

E48.18 Mechanical Pavers

(a) Asphalt pavers shall be self-propelled and capable of laying a consistent lift which is true to the specified geometrics, cross-section and alignment. Pavers shall be equipped with hoppers and distributing screws capable of placing the hot mix evenly in front of the screeds.

(b) Asphalt pavers shall be equipped with automatic longitudinal and transverse grade and slope controls which are capable of being operated from either side of the paver. The longitudinal grade control shall be readily adjustable for lift thickness in small increments without the necessity of stopping the paver.

(c) The use of any paver that is experiencing difficulty in achieving a consistent and smooth lift in conformance with this Specification shall be discontinued until the Contractor demonstrates suitable corrective measures.

(d) Two pavers will be required for Echelon Paving. Locations for echelon paving are detailed within this specification.

E48.19 Rollers

(a) A rolling pattern shall be established and submitted by the Contractor to the Contract Administrator for approval before paving. The Contract Administrator shall approve any deviation from the rolling pattern during construction.

(b) The Contract Administrator shall be provided with the mass of the rollers and may require they be weighed.

(c) Rollers shall be classified into categories in accordance with Table E48.6.

Table E48.6: Roller Classifications

Type	Description	Classification	Minimum Mass, tonnes
Class S	Self-propelled steel-drum roller	S1	7
		S2	9
Class R	Self-propelled pneumatic-tired rollers Or Self-propelled combination roller	R1	8
		R2	15
Class V	Self-propelled vibratory roller	V1	4
		V2	5.2
		V3	5.8

(d) Rollers shall be equipped with an automatic device that prevents the drum from vibrating unless the roller is moving and shall automatically halt vibration before coming to a stop. Frequency of vibration shall not be less than 2200 per minute. Vibration should not be used where there is potential to damage services and structures, or cause nuisance complaints as directed by the Contract Administrator.

CONSTRUCTION METHODS

E48.20 General

(a) All construction methods shall conform to this Specification, except as otherwise approved by the Contract Administrator.

E48.21 Preparation of Base Course for Asphalt Pavement

(a) General

(i) Placing of the asphalt mixture shall not commence until the construction of the sub-grade, sub-base and Base Course has been completed in accordance with the requirements of Specification CW 3110, and the installation of pavement and boulevard structures and appurtenances has been completed to the satisfaction of the Contract Administrator.

(ii) Where Base Course has raveled, the loose material shall be removed or recompacted to a uniform surface.

(b) Prime Coat

(i) Application of prime coat shall consist of flushing the final accepted Base Course layer with diluted emulsified asphalt. Use an equal volume of water to dilute the emulsified asphalt unless otherwise specified by the Contract Administrator. Surfaces to be prime coated shall be free of standing water and contamination, such as mud, loose aggregate, or debris.

(ii) The application rate of undiluted prime shall be between 0.5 to 1.0 L/m2 and shall be approved by the Contract Administrator.

(iii) Prime coat shall be placed with sufficient time to cure prior to paving. Asphalt mix shall not be placed on prime coated areas until the prime coat is cured for a minimum of eight (8) hours or until prime coat cannot be tracked by foot traffic and

tires. Paving and construction equipment shall not be permitted onto the prime coat until it has broken and set. Traffic shall not be permitted on the prime coat.

(iv) Prime coat shall be visually uniform. Prime coat shall be reapplied to areas of insufficient or non-uniform coverage. A hand spray can be used to apply prime coat to areas missed or inaccessible by the distributor. When prime coating is performed using hand spray, the visual appearance of such areas shall be consistent with the adjacent areas.

(v) Prime coat shall not be applied when the weather is foggy or rainy or when the ambient temperature is less than 0°C. If the ambient temperature is less than 0°C as forecast by the nearest official meteorological office, the product used for prime coat shall be approved by the Contract Administrator.

(vi) Before applying the prime coat, the surface shall be flushed with water to create optimal conditions for adhesion, absorption control, and overall effectiveness of the prime coat and shall be approved by the Contract Administrator.

(vii) After curing, if any excess primer remains on the surface, the Contractor shall apply an approved sand where necessary to blot up the excess prime. The sand cover, where used, shall consist of clean, granular, mineral material approved by the Contract Administrator, all of which shall pass a 4.75 mm sieve. Only sufficient sand shall be spread to blot up excess prime and such areas shall be broomed to remove the excess sand prior to paving.

(viii) Prime coat shall be inspected and approved by the Contract Administrator before any asphalt is placed. Otherwise the asphalt shall be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

(ix) When traffic flow must be maintained, prime coat shall be applied to one direction of the roadway at a time. No prime coat shall be applied to the other direction of the roadway until the first direction has cured to accommodate vehicular traffic.

E48.22 Preparation of Asphalt or Portland Cement Concrete Pavement for Asphalt Overlay

(a) Asphalt Surface Pavement

(i) A layer of the existing asphalt surface course shall be removed to such depth as is specified on the Drawings or as directed by the Contract Administrator. This work will be done and paid for in accordance with Specification CW 3450.

(ii) If the entire existing asphalt overlay is removed to the existing portland cement concrete pavement, the preparation of the existing Portland cement concrete pavement for asphalt overlay shall be in accordance with the requirements of Placing Asphalt Paving Mixture of this Specification.

(iii) If the surface remaining after the removal of the specified layer of asphalt surface course is asphalt, the Contractor shall proceed to fill any remaining holes and depressions with asphalt paving mixture and compact these areas with a steel wheel roller before paving. The asphalt surface upon which the asphalt overlay is to be placed shall be approved by the Contract Administrator prior to placing asphalt.

(iv) At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall adjust existing structures and appurtenances, reconstruct sections of curb, seal all cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the curb renewal, crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

(b) Portland Cement Concrete Pavement Surface

(i) At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall adjust existing structures and appurtenances, reconstruct sections of concrete pavement, reconstruct sections of curb, seal all joints and cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the pavement reconstruction, curb

renewal, joint and crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

(c) Tack Coat

(i) Application of tack coat shall consist of flushing the final accepted surface with undiluted emulsified asphalt. Surfaces to be tack coated shall be free of standing water and contamination, such as mud, loose aggregate, or debris.

(ii) Tack coat shall be required between layers of asphalt material and the application rate shall be in accordance with Table E48.7, unless otherwise specified by the Contract Administrator.

Table E48.7: Application Rate for Tack Coat

Surface Type	Application Rate, L/m^2	Max Allowable Tolerance, L/m^2
New Asphaltic pavement	0.25	0.03
Old Asphaltic pavement, Portland Cement Concrete, Milled Surface	0.35	0.05

(iii) Tack coat shall be placed with sufficient time to cure prior to paving. Asphalt mix shall not be placed on tack coated areas until the tack coat is cured for a minimum of three (3) hours or until tack coat cannot be tracked by foot traffic and tires. If trackless tack is used, the curing time can be reduced in accordance with the manufacturer's specifications unless otherwise specified by the Contract Administrator. Paving and construction equipment shall not be permitted onto the tack coat until it has cured and set. Traffic shall not be permitted on the tack coat.

(iv) Tack coat shall be visually uniform. Areas of insufficient or non-uniform tack coat coverage shall be re-sprayed. Hand spray can be used to apply tack material to areas missed or inaccessible by the distributor including curb areas attached to the asphalt. When tack coating is performed using hand spray, the visual appearance of such areas shall be consistent with the adjacent areas of machine applied material.

(v) Tack coat shall not be applied when the weather is foggy or rainy or when the ambient temperature is less than 5°C. If the ambient temperature is less than 5°C as forecast by the nearest official meteorological office, the product used for tack coat shall be approved by the Contract Administrator.

(vi) Tack coat shall be inspected and approved by the Contract Administrator before any asphalt is placed.

E48.23 Placing Asphalt Paving Mixture

E48.23.1 General

(a) The Contract Administrator shall approve the surface upon which new asphalt is to be placed before paving operations may begin.

(b) The mixture shall be delivered to the job and placed at a temperature that allows for proper compaction, taking into consideration the weather conditions, the temperature of the surface on which the mixture is to be placed, and the thickness of the lift. In no case shall the asphalt mixture be placed at a temperature lower than the values specified in Table E48.8.

Table E48.8: Limits for Asphalt Mixes Temperatures

Asphalt Type	Temperature for Asphalt before Placing, °C		Minimum Temperature During Rolling, °C
	Minimum	Maximum	
HMA	125	160	90
WMA	115	155	80

(c) Unless otherwise permitted by the Contract Administrator, the mixture shall be spread by means of a mechanical self-powered paver capable of spreading the mixture true to the line, grade and crown required.

(d) Pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. The mixture shall be dumped in the centre of the hoppers and care exercised to avoid overloading and slopping over of the mixture upon the base.

(e) When laying the mixture, pavers shall operate so as to provide as continuous an operation as possible at a speed of between three meters and six meters per minute. They shall be equipped with a quick and efficient steering device and shall have forward and reverse travelling speeds of not less than 25 meters per minute.

(f) Pavers shall be capable of spreading the mixture, without segregation, in thicknesses as specified on the Drawings or approved by the Contract Administrator. Placement widths shall vary from a minimum of 1.5 meters to a maximum of 5.3 meters unless approved by the Contract Administrator. They shall be equipped with blending or joint levelling devices for smoothing and adjusting all longitudinal joints between strips or courses of the same thickness. Pavers shall be equipped with screeds.

(g) The Contractor shall lay the asphalt mixture with two pavers (Echelon Paving) on lanes and shoulders grouped together below:

(i) Lagimodiere Boulevard Northbound (between stations 20+850 and 21+980)

- Group 1: Left lane and left shoulder – 1st paver
- Group 2: Right lane only – 2nd paver (will include right shoulder if shoulder width is less than 2.0 m)

(ii) Lagimodiere Boulevard Southbound (between stations 30+850 and 31+980)

- Group 1: Left lane and left shoulder – 1st paver
- Group 2: Right lane only – 2nd paver (will include right shoulder if shoulder width less than 2.0 m)

(h) The Contractor shall lay the asphalt mixture with a single paver on lanes and shoulders grouped together below:

(i) Lagimodiere Boulevard Northbound (between stations south construction limit and 20+860 and stations 21+980 and north construction limit)

- Group 1: Left lane and left shoulder
- Group 2: Right lane only – 2nd paver

(ii) Lagimodiere Boulevard Southbound (between stations 31+980 and north construction limit)

- Group 1: Left lane and left shoulder – 1st paver
- Group 2: Right lane only – 2nd paver (will include right shoulder if shoulder width less than 2.0 m)

(iii) Concordia Avenue (between west construction limit to 0+195, 0+422 to east construction limit)

(iv) All ramps

- Group 1: Lane
- Group 2: Right shoulder

(i) The term screed includes any strike-off device operated at workable temperature without tearing, shoving or gouging the finished surface.

(j) The minimum and maximum thickness of a compacted lift for reconstruction shall be in accordance with Table E48.9, unless otherwise specified by the Contract Administrator.

Table E48.9: Lift Thicknesses

Mix Type	Thickness, mm	
	Minimum	Maximum
MS1	35	55
MS2	50	75
SP1	35	55
SP2	50	75

(k) No construction traffic shall travel on the finished surface until the surface has cooled to a temperature of 60°C or less.

E48.23.2 Main Line Paving

(a) Main line paving shall include the placement of bottom and top lifts for asphalt pavements and overlays utilizing mechanical pavers with automatic grade control for:

(i) All through and parallel turning lanes greater than 15.0 meters in length;

(ii) All shoulders;

(iii) All ramps;

(iv) All pathways;

(v) All turn lanes at intersections;

(vi) Median openings at intersections;

(vii) Other lanes greater than 15.0 metres in length; and,

(viii) Intersections through which the main line continues.

(b) Main line paving with mechanical pavers shall utilize automatic grade control, except for:

(i) Intersections through which the main line continues and where traffic must be maintained; and,

(ii) The side of the paver adjacent active traffic.

(c) Hand placement shall be minimized. Hand placed asphalt shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator.

E48.23.3 Tie-Ins and Approaches

(a) Tie-Ins and approaches shall include the placement of leveling and surface courses for pavements and overlays for all areas other than main line paving lanes. This includes intersecting side streets to the main road under construction except as noted in the Placing Asphalt Paving Mixture of this specification, intersection turnouts, right turn cut-offs, median openings, and private approaches. Tie-ins include miscellaneous asphalt for temporary ramping, sidewalk in-fill and isolations.

(b) Tie-ins shall include the 0.8 m strip of asphalt along the south gutter of Concordia Ave. adjacent to the new modified barrier curb.

(c) Tie-Ins and approaches shall utilize mechanical pavers where possible with or without automatic grade control, or hand methods as approved by the Contract Administrator.

(d) Hand placement shall be minimized. Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator.

E48.23.4 Weather Limitations

(a) Asphalt shall be laid upon a surface which is dry, clean and free from standing water, and only when weather conditions are suitable in accordance with Table E48.10.

Table E48.10: Minimum Placement Temperature for Asphalt

	Location		Temperature*, C°

Asphalt Type		Lift Thickness, mm	Wind Speed, km/hr > 10	Wind Speed, km/hr ≤ 10
HMA	Top Lift	< 50	10°C	6°C
		≥ 50	8°C	6°C
	Other than top lift	> 50	2°C	2°C
WMA	Top Lift	< 50	4°C	0°C
		≥ 50	2°C	0°C
	Other than top lift	> 50	0°C	-2°C

*Temperature shall be based on the nearest official meteorological office. The Contract Administrator may confirm the temperature by measuring the temperature in the shade and 150 mm above the surface.

(b) Asphalt shall be placed on unfrozen material, free of water, snow, and ice. Frozen material will be identified by measuring the surface temperature using infrared thermometers or similar devices. If the surface temperature is less than or equal to 0°C, the material will be considered frozen. The Contractor shall use suitable heating methods to maintain the surface temperature above 0°C. Salt shall not be used to thaw ice, snow, or frost.

(c) Paving shall not be permitted while there is frost within 750 mm of the surface upon which the asphalt is to be placed. Asphalt shall only be laid under conditions that the Contract Administrator determines to be conducive to obtaining the specified results.

(d) Notwithstanding the above, when weather conditions are unfavourable, or are likely to become unfavourable, paving operations shall be suspended.

E48.24 Joints

E48.24.1 General

(a) Joints shall be smooth, well bonded and tightly sealed. Joints shall conform smoothly and accurately to adjacent pavement surfaces such that when tested with a 3-metre straight edge placed across the joint the distance between the straight edge and the surface of the pavement shall not exceed 5 mm at any point.

(b) When matching a compacted joint, the depth of the uncompacted lift shall be set to allow for compaction. The paver screed shall overlap the adjoining lift by no more than 25 mm.

(c) On straight sections the joint line shall not deviate from a straight line by more than 75 mm at any point. On curved or tapered sections, the joint shall be shaped so as to be as smooth as possible. Jagged, stepped or wandering edges shall be reshaped to a smooth line, to the satisfaction of the Contract Administrator, before the adjacent lift is laid.

E48.24.2 Location of Joints

(a) The location of joints shall be subject to the approval of the Contract Administrator and shall conform to the following requirements:

(i) Longitudinal joints shall not be located within 150 mm of a longitudinal joint in any underlying pavement structure.

(ii) Transverse joints shall not be located within two (2) meters of any other transverse joint in the same paving course or within one (1) meter of a transverse joint in any underlying pavement structure.

(iii) Longitudinal cold joints are to be avoided wherever possible. Transverse joints shall be established with sufficient frequency to allow the full width of the paving course to be placed in a single shift. No paving lane shall progress more than 500 m beyond the end of an adjacent paving lane in the same course without the prior approval of the Contract Administrator.

(iv) Where Echelon Paving is specified 1st and 2nd pavers shall be within close proximity to avoid a longitudinal joint.

E48.25 Asphalt Patching

E48.25.1 General

(a) Remove and replace existing asphalt pavements adjacent to proposed or renewed sidewalks and concrete approaches for grade adjustment to ensure drainage and rideability are maintained. Areas to be considered as asphalt patches shall be less than 1.5 meters in width. The locations requiring asphalt patching shall be shown on the Drawings or as directed by the Contract Administrator.

(b) The Contractor shall saw cut the asphalt pavement full-depth along the limits designated. The asphalt pavement shall be removed and disposed of in accordance with CW 3110. Upon removal of asphalt, the existing base materials shall be levelled and compacted. The asphalt shall match the thickness of the existing pavement. The material shall be placed and compacted by acceptable methods in accordance with Clause 6.7 of this specification to the satisfaction of the Contract Administrator.

(c) All costs incurred for asphalt removal, compaction of existing base materials and placement of Base Course and asphalt materials shall be included in the unit price for "Construction of Asphalt Patches"

E48.25.2 Compaction of Asphalt Paving Mixture

(a) A rolling pattern shall be established by the Contractor and approved by the Contract Administrator. The Contract Administrator shall approve any deviation from the rolling pattern.

(b) The minimum number of rollers is identified in Table E48.11.

Table E48.11: Maximum Rates Per Paver and Roller Sequence

Asphalt Placement, tonnes/hr	Minimum Roller Combinations per Paver Breakdown + Intermediate + Finish*
≤ 100	S2 + R1 +S1 V1 + R1 + S1
> 100	S2 + 2 x R1 + S1 S2 + R2 + S1 V2 + 2 x R1 +S1 V2 + R2 + S1

*No vibration shall be used when paving bridge decks. If Class V rollers are used, they shall be in static mode. The V3 roller can be used as a substitute for the V2 roller.

(c) The operating speed of rollers shall not exceed 5 km/hr and shall be slow enough to avoid undue displacement of the asphalt. Rollers shall operate with the drive wheel forward in the direction of paving.

(d) Any displacement occurring as a result of reversing the direction of the roller or any other cause shall be corrected. Rolling shall proceed continuously until all roller marks are eliminated and no further compression is possible. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened with water, limewater, or an approved detergent. Excess moisture will not be permitted.

E48.25.3 Rolling procedures

(a) Compaction of the paving mixture shall consist of three (3) separate rolling operations as follows:

(i) Breakdown rolling: Rolling shall start longitudinally at the sides and proceed toward the centre of the pavement overlapping on successive passes by at least 150 mm. Breakdown rolling shall consist of at least two complete coverages by the roller. Delays in rolling freshly placed asphalt shall not be permitted.

(ii) Intermediate rolling shall immediately follow breakdown rolling. Passes shall be arranged to ensure overlapping successive tire paths. The rolling operation shall prevent pick-up of the mixture on the tires.

(iii) Final rolling shall be undertaken while the paving mixture is still warm enough to eliminate roller marks. Where the width permits, the asphalt shall be rolled diagonally in two directions, the second diagonal rolling crossing the first rolling direction. Final rolling shall start longitudinally at the high edge and proceed towards the lower edge of the mat. Final rolling shall be continue until there is no evidence of consolidation.

E48.25.4 Compaction of Irregular Areas

(a) Along curbs, manholes and similar structures and at all places not accessible to rollers, compaction shall be performed by plate compactors to the satisfaction of the Contract Administrator. All joints around these structures shall be effectively sealed.

(b) The asphalt may be heated to a maximum temperature of 120°C to facilitate the compaction where approved by the Contract Administrator.

E48.25.5 Requirements After Final Rolling

(a) After final rolling the surface of each lift shall be smooth and true to the established crown and grade. Any low or defective spots shall be remedied by milling to a minimum depth of 40 mm or as directed by the Contract Administrator and replacing it with a fresh mixture.

(b) The corrected area shall have a smooth transition to the surrounding pavement without negatively affecting any adjacent sections, impairing the functionality and the service life of the area.

E48.25.6 Filling of Core Holes

(a) Where cores are collected, the Contractor shall patch each core hole immediately with an approved cold asphalt product.

(b) The patch shall be finished flush with the surface. Immediately before filling, the surface of each hole shall be thoroughly cleaned to ensure a proper bond. After filling each hole, all excess material shall be removed from the surface.

(c) Where HMA or WMA are not available, use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at:

https://legacy.winnipeg.ca/matmgt/spec/default.stm

E48.25.7 Surface Tolerance

(a) The surface of the asphalt pavement shall be checked with a 3-metre straight edge and be within ± 5 mm from the surrounding area. Areas that do not meet these tolerances shall be corrected to the satisfaction of the Contract Administrator.

(b) Where the posted speed limit is greater than 60 km/hr, the Contract Documents shall identify smoothness requirements for longitudinal profile of the pavement surface. The smoothness requirements shall be approved by the City of Winnipeg, Research and Standards Engineer.

E48.25.8 Opening to Traffic

(a) In no case shall traffic or construction equipment be allowed on the asphalt pavement until completion of quality assurance testing by the Contract Administrator and until the completed pavement has cooled to atmospheric temperature or to such other temperature, as may be approved by the Contract Administrator, that will ensure no deformation of the pavement surface under traffic loading.

(b) The Contract Administrator's decision as to when the pavement will be opened to traffic shall be final. Prior to opening to traffic, the pavement shall be clean and free of aggregates or other deleterious materials on the surface.

QUALITY ASSURANCE

E48.25.9 General

(a) Tests used for purposes of assessing compliance with this specification or for acceptance of any products shall be conducted by a certified laboratory approved by the City of Winnipeg, Research and Standards Engineer.

(b) Field sampling and testing of asphalt shall be performed by a certified person.

(c) The Contract Administrator shall be allowed access to all sampling locations and reserves the right to request quality assurance sample(s) at any time.

(d) Samples shall be protected during transportation from any exposure to adverse conditions.

(e) If any sample shows distinct evidence of improper sampling, handling, or testing, the test shall be disregarded and a new sample shall be collected.

(f) Testing in addition to the requirements of this Specification shall be as directed by the Contract Administrator.

E48.25.10 Testing Frequency

(a) Asphalt shall be sampled for acceptance in accordance with the following Table E48.12.

Table E48.12: Frequency of Sampling and Testing of Asphalt

Asphalt Type	Quantity (tonnes)	Minimum Frequency
MS1, MS2	< 150 150 - 300 > 300	2 test/day 3 tests/day 2 test/150 tonnes
SP1, SP2	--	2 test/150 tonnes

(b) Additional testing shall be as directed by the Contract Administrator.

(c) Copies of all test results shall be sent to the City of Winnipeg, Research and Standards Engineer and to the Contract Administrator.

(d) Copies of asphalt plant scale tickets shall be provided to the Contract Administrator.

E48.25.11 Acceptance Criteria

(a) The Contractor shall reimburse the City for any additional costs the City incurs as a result of failed tests.

(b) Where the work is not funded or administered by the City of Winnipeg or their representative, the party approved by the City of Winnipeg to execute the work will be responsible for making pay adjustments to the City of Winnipeg.

(c) All corrective actions shall be performed at the Contractor’s expense.

(d) Acceptance of asphalt shall be based on the following:

(i) Visual Inspection:

- The Contract Administrator may reject visually defective asphalt areas based on, but not limited to, the following defects: flushing, bleeding, segregation, fat spot, surface damage, and surface contamination. Such

defective areas shall be removed and replaced at the Contractor's expense.

(ii) Bituminous Mix Properties:

- Air Voids: If the measured air voids fall outside the limits specified in the Design Requirements of this Specification, the Contract Administrator shall apply a payment adjustment in accordance with Table E48.13 against the entire Lot represented by the failed test(s).

Table E48.13: Payment Adjustment for Air Voids

Asphalt Type	Average of the Failed Tests	Percent of Price Reduction %
MS1, MS2, SP1, SP2	≤ 0.5%	0.0
	0.5% to 1%	0.0*
	> 1%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

- Voids in Mineral Aggregate (VMA): If the measured voids in mineral aggregate falls outside the limits specified in the Design Requirements of this Specification, the Contract Administrator shall apply a payment adjustment in accordance with Table E48.14.

Table E48.14: Payment Adjustment for Voids in Mineral Aggregate

Average of the Failed Tests	Percent of Price Reduction %
≤ 0.5%	0.0
0.5% to 1%	0.0*
1% to 2%	
> 2%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

- Asphalt Cement Content: If the measured asphalt cement content falls outside the limits specified in the Design Requirements of this Specification, the Contract Administrator shall apply a payment adjustment in accordance with Table E48.15 against the entire Lot represented by the failed test(s).

Table E48.15: Payment Adjustment for Asphalt Cement Content

Average of the Failed Tests	Percent of Price Reduction %
≤ 0.15%	0.0
0.15% to 0.5%	0.0*
> 0.5%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

- Gradation: If the gradation falls outside the limits specified in Table E48.16, the Contract Administrator shall apply a payment adjustment in accordance with Table E48.16 against the entire Lot represented by the failed test(s).

Table E48.16: Payment Adjustment for Gradation

Percent Passing Outside the JMF for Each Sieve			Percent of Price Reduction %
19, 16, 12.5, 9.5	**4.75, 2.36, 1.18, 0.6, 0.15**	**0.075**	
<2	<1	-	0.0
2-4	1-2	<1	0.0*
> 4	> 2	≥ 1	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

E48.25.12 Density:

(a) Density testing shall be conducted at least once every 150 m^2. The Contract Administrator shall ensure that the density tests cover the full width of the construction area.

(b) An area is deemed unacceptable if the compaction does not meet all of the following:

(i) The average density results shall be between 93% and 95% of the theoretical maximum density; and,

(ii) No individual location shall be less than 90% or higher than 98% of the theoretical maximum density.

(c) Nuclear density test gauge results shall be used to assess in-place density. When density test results do not meet the minimum percent density specified herein, a coring and testing program can be undertaken to verify density percentage of the mix by Core Density Testing. If core density results confirm the Nuclear density results, the Contractor shall reimburse the City for any additional costs associated with coring, transmittal of cores, filling of cores and testing the City incurs as a result of failed tests.

(d) The Contract Administrator shall apply a payment adjustment in accordance with Table E48.17 against the entire lot represented by the failed test(s).

Table E48.17: Payment Adjustment for Density

Average of the Density Tests	Percent of Price Reduction %
> 98%	Remove and replace at Contractor's expense
97.9% to 97.1%	0%*
97% to 93%	0%
92.9% to 90%	0%*
< 90%	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

E48.25.13 Segregation and Surface Defects

(a) Surface defects include but are not limited to: gouges, slippage, cracking, tearing, pocketing, blistering, shoving, wash boarding, surface depressions or surface defects shall be repaired to the satis-faction of the Contract Administrator.

E48.25.14 Asphalt Thickness:

(a) A Lot is deemed unacceptable if the asphalt thickness does not meet all of the following:
  (i) The average thickness is less than the required thickness; and,
  (ii) No individual thickness shall be less than 90% of the required thickness.

(b) The Contract Administrator shall apply a payment adjustment in accordance with Table E48.18 against the entire Lot represented by the insufficient thickness.

Table E48.18: Payment Adjustment for Pavement Thickness

Average Thickness	Percent of Price Reduction %
Less than specified thickness but more than 90% of specified thickness	0.0*
Less than 90% of specified thickness	Remove and replace at Contractor's expense

*Paving shall be suspended until necessary adjustments are made and approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E48.26 Construction of Asphalt Pavement

(a) Construction of asphalt pavement will be measured and paid for at the Contract Unit Price per tonne for the "Items of Work" listed here below, measured as specified herein, 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.

(b) Items of Work:
  (i) Construction of Main Line Paving (SP1)
  (ii) Construction of Main Line Paving (MS1)
  (iii) Construction of Tie-ins and Approaches (SP1)
  (iv) Construction of Tie-ins and Approaches (MS1)

(v) The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

E48.27 Construction of Asphalt Patches

(a) Construction of asphalt patches will be measured and paid for at the Contract Unit Price per square meter for "Construction of Asphalt Patches", measured as specified herein, 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.

E49. PAVEMENT RAISING ON BRIDGE APPROACHES

DESCRIPTION

E49.1 This Specification outlines the requirements for pavement raising at bridge approaches, detailing layer thickness parameters for three application categories: A, B, and C. It serves as a standalone document, as there is no existing City of Winnipeg standard specification directly addressing this work.

SCOPE OF WORK

E49.2 The pavement raising shall be executed according to the following application categories, ensuring proper material placement, layer thickness, and compaction:

(a) Category C: Involves the greatest thickness, including a sub-base layer, base layer, and asphalt pavement.

(b) Category B: Entails intermediate thickness, consisting of a base layer and asphalt pavement.

(c) Category A: Comprises the least thickness, involving asphalt pavement only, designed for final tie-in sections.

E49.3 Each category corresponds to designated bridge approach areas as depicted in the contract drawings.

MATERIALS

E49.4 Materials shall conform to the following specifications:

(a) Sub-base Material: As specified in CW 3110.

(b) Granular Base Material: As specified in CW 3110.

(c) Asphalt Pavement: As specified in E48.

CONSTRUCTION REQUIREMENTS

E49.5 Layer Thickness and Transitions

(a) Adhere to the layer thickness ranges indicated on the drawings.

(b) Verify and adjust thickness values based on final roadway elevations and slope transitions.

E49.6 Compaction & Quality Control

(a) Compact each layer to a minimum of 98% Standard Proctor Density (SPD) for granular materials and 92% to 97% of Maximum Theoretical Density (MTD) for asphalt.

(b) Conduct quality control testing at each stage before proceeding with subsequent layers.

E49.7 Tie-in to Existing Pavement

(a) Ensure a smooth transition between the new pavement and existing road by feathering and milling as necessary to achieve uniform ride quality.

MEASUREMENT AND PAYMENT

E49.8 Payment for pavement raising shall be included in the unit prices for the respective items:

(a) Sub-base Material (if applicable): Per tonne.

(b) Granular Base: Per cubic meter.

(c) Asphalt Pavement: Per tonne.

E49.9 No separate payment shall be made for feathering, milling, or transition work, as these are considered incidental to the pavement raising.

E50. STRAW WATTLES

DESCRIPTION

E50.1 This Special Provision covers the supply and installation of straw wattles for temporary sediment and erosion control to protect adjacent watercourses, storm drainage instrastructure, and environmentally sensitive areas during construction. This specification is required as no equivalent is currently available in the City of Winnipeg's Standard Construction Specifications.

MATERIALS

E50.2 Straw wattles shall be 300 mm diameter straw rolls, such as Stenlog or approved equal, encased in biodegradable netting.

E50.3 Wattles shall be comprised of 100% natural agricultural straw.

E50.4 Submit product data sheets, including manufacturer name, product specifications, and installation details to the Contract Administrator at least five (5) Business Days before installation.

CONSTRUCTION METHODS

E50.5 Install straw wattles as shown on the drawings or where directed by the Contract Administrator, particularly around riprap areas, catch basins, and drainage outlets.

E50.6 Ensure a tight seal between the wattle and soil by trenching wattles 50 mm into the ground and compacting backfill.

E50.7 Overlap ends by 150 mm when joining multiple sections.

E50.8 Stake wattles using 300 mm wooden stakes placed every 1.2 metres and at all overlaps.

E50.9 Inspect wattles regularly and after rainfall. Replace or reposition as necessary.

MAINTENANCE

E50.10 Maintain wattles in functional condition throughout the duration of their use.

E50.11 Remove accumulated sediment as needed to maintain effectiveness.

E50.12 Replace wattles that are damaged, moved, or clogged at no additional cost to the Contract.

E50.13 Remove wattles upon final site stabilization or as directed by the Contract Administrator.

MEASUREMENT AND PAYMENT

E50.14 The supply, installation, maintenance, and removal of straw wattles shall be incidental to the Work and will not be measured separately.

E51. SUPPLY AND INSTALLATION OF THRIE BEAM, W-BEAM GUARDRAILS AND ACCESSORIES

DESCRIPTION

E51.1 The Work shall consist of supply and installation of roadside hazard protection meeting the AASHTO Manual for Assessing Safety Hardware (MASH) Test Level 3 or NCHRP Report 350: Recommended Procedures for the Safety Performance Evaluation of Highway Features, including:

(a) W-Beam guardrail (Midwest Guardrail System) with steel posts and neoprene spacer blocks;

(b) End treatments.

(c) Thrie beam guardrail including asymmetrical transition section and Thrie beam terminal connector.

(d) End Terminus including End Terminus terminal connector.

E51.2 Supply, loading, hauling, unloading, storing and installing of roadside hazard protection guardrail, guardrail end treatment, posts, and all related appurtenances in accordance with the Drawings and Manufacturer's recommended installation procedures;

E51.3 Field drilling, threading and cutting bolts, as required;

E51.4 Supply, placing and compacting backfill material.

E51.5 The Thrie beam guardrail shall be erected and connected to the northwest and northeast corners of the southbound bridge and the southwest and southeast corners of the northbound bridge completed with the asymmetrical transition section, as per Drawings. Included in the work associated with this Specification, shall be the supply and installation of all thrie beam guardrail components and fasteners.

E51.6 The End Terminus shall be erected and connected to the northeast corner of the northbound exit ramp as per Drawings. Included in the work associated with this Specification, shall be the supply and installation of all End Terminus components and fasteners.

MATERIALS

E51.7 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this specification.

E51.8 Guardrails and posts shall be stored in neat regular piles, on blocks or built up platforms, in order to avoid damage or contamination, and for ease of checking, handling, and inspection.

E51.9 Testing, Inspection 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 for any materials taken by the Contract Administrator for testing purposes.

(b) Materials which fail to meet these specifications will be rejected, and shall be replaced or repaired at no additional cost.

E51.10 Guardrails and Terminal Elements

(a) All guardrail sections and other components shall match the design profiles and dimensions of the AASHTO/ARTBA hardware requirements.

(b) The guardrails and terminal elements shall be manufactured from open hearth, electric furnace or basic oxygen semi-spring steel sheet, all in general accordance with the AASHTO Standard Designation M180 and shall conform to the Drawings provided in the

contract and in the AASHTO-AGC-ARTBA publication “A Guide to Standardized Highway Barrier Hardware”.

(c) Guardrails shall be punched for splice and post bolts in conformity with AASHTO Standard to the designated number of and centre to centre spacing of posts. If holes are punched after galvanizing, the galvanizing around the hole shall be repaired in accordance with the latest edition of CSA Standard G164-M92 (R2003) or ASTM A780/A780M-09.

(d) Guardrails shall have minimum yield strength of 345 MPa, minimum tensile strength of 483 MPa, and minimum elongation of twelve percent (12%) in 50 mm length.

(e) The thickness of guardrails and terminal elements shall be manufactured according to Table 2 (Class A Type II) of AASHTO Standard M180 with nominal base metal thickness of 2.67 mm, galvanized finished thickness of 2.82 mm, with a tolerance of 0.23 mm.

(f) Sheet width for the W-beam guardrail shall be 483 mm with a permissible tolerance of minus 3 mm.

(g) All guardrails and terminal elements shall be hot dip galvanized according to CAN/CSA A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

(h) All welding for the fabrication of terminal elements shall conform to the requirements of CSA W59M. All welders, welding operators and tackers shall be approved by the Canadian Welding Bureau in their particular category.

(i) A copy of the producer’s certificate, conforming to Section 16 of CSA G40.20M, for each of the mechanical and chemical tests, including impact tests, shall be provided to the Contract Administrator upon request.

(j) Terminal ends to be precast by Trinity Highway Products, LLC as indicated on Drawings or approved equal in accordance with B6.

E51.11 Steel Posts

(a) Steel posts shall be W150 x 14;

(b) Steel for posts and hardware shall conform to CAN/CSA Standard G40.21 Grade 350W or ASTM Standard A36 and shall be hot dip galvanized after fabrication conforming to ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E51.12 Neoprene Spacer

(a) Spacers shall be King Blocks by Trinity Highway Products, LLC or approved equal in accordance with B6.

(b) Bolts, nuts, washers and other appurtenances.

(c) All bolts, nuts and washers shall be according to ASTM A307 and shall be hot dip galvanized conforming to the current edition of ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E51.13 Markings

(a) Each guardrails shall be marked with the following information:

(i) Name, trademark, or brand of the manufacturer.

(ii) Identification symbols or code for heat.

(iii) Week number and year of production.

(b) Markings shall be clearly and permanently stamped in the valley of the centre corrugation, placed at the location clear of the splice overlap, and shall not be obscured after installation. The height of the letters and numerals shall be within the range of 19 to 32 mm.

E51.14 Thrie Beam Guardrail

(a) The Thrie Beam guardrail and all incidental components shall be galvanized.

E51.15 End Terminus

(a) The End Terminus and all incidental components shall be galvanized.

CONSTRUCTION METHODS

E51.16 Handling and Storage of Materials

(a) All materials shall be handled in a careful and workmanlike manner and the sections and ends shall be stored on blocks or built-up platforms.

(b) Bolts and malleable washers shall be stored separately in suitable bins for inspection, checking and handling.

E51.17 Site Inspection

(a) Prior to commencing installation of the protection at a location, the Contractor shall verify that it can be installed in strict accordance with the Drawings. This shall include contacting all utilities and other owners of underground facilities in order to ensure that the proposed location of the posts is not in conflict with existing or proposed utilities and installations.

(b) Should there be a conflict between a proposed location and any facility the Contract Administrator shall be notified immediately.

E51.18 Assembly and Installation

(a) All materials and parts shall be assembled and installed in accordance with the manufacturers' requirements and recommended procedures.

E51.19 Post Installation

(a) Holes for the posts shall be 300 mm in diameter and be excavated by auger.

(b) Excavated material which is unsuitable for use as backfill shall be replaced with granular material meeting the requirements of Section 2.2 of Specification CW 3110 for base course material.

(c) Crushed limestone base course is not allowed for use.

(d) The posts shall rest directly and solidly on the bottom of the hole.

(e) After the post is installed, it shall be backfilled with granular material. Backfill shall be thoroughly compacted, using pneumatic tampers, in layers not exceeding 150 mm. Unsuitable material at the bottom of the holes excavated shall be replaced with granular material at the Contractor's expense, as directed by the Contract Administrator.

(f) The Contractor shall thoroughly compact the bottom of the holes.

(g) Surplus excavated material and debris shall be removed from the Site.

(h) The Contractor shall place and compact 50 mm asphalt on the top surface of the leave out section to match final roadway elevations. Supply and compacted asphalt shall be paid in accordance CW3410.

E51.20 Guardrail Installation

(a) Guardrail shall be accurately set to the required depth and alignment, in a manner resulting in a smooth continuous installation, as shown on the Drawings or as directed by the Contract Administrator. Permissible tolerance for plumb and grade of posts shall be 6 mm.

(b) Any guardrail material requiring field modification to fit shall be reported to the Contract Administrator for its acceptance of the modification prior to the Work being carried out.

(c) Modification by flame cutting method is prohibited.

(d) Modification by cold cutting method with a suitable drill press is allowed.

(e) Field guardrail modification is considered incidental to the Work. Adequate edge distances of guardrail material shall be maintained during the modification process. All exposed steel areas shall be patched with two (2) coats of zinc-rich paint.

(f) Guardrail laps shall be in the direction of traffic flow.

(g) Bolts shall be tightened to a torque of 100 Nm.

(h) The Contractor shall take all necessary precautions to eliminate damage to galvanizing. Minor abrasions shall be repaired by re-galvanizing. The method to be used for repair of any damage shall be accepted by the Contract Administrator before such Work is commenced. The Contractor shall repair or replace components to the satisfaction of the Contract Administrator.

E51.21 ET-31 End Treatment

(a) The ET-31 end treatment, shall be installed as indicated on the Drawings. Installation of the ET-31 end treatment shall be completed in accordance with the Specifications and the manufacturer's recommendations.

E51.22 Cleaning

(a) After installation of the rail system has been completed, the entire rail system shall be thoroughly cleaned to the satisfaction of the Contract Administrator.

MEASUREMENT AND PAYMENT

E51.23 Supply and installation of roadside hazard protection guardrail, thrie beam terminal connectors, thrie beam, asymmetrical transition sections, posts and all related appurtenances will be measured on a length basis and paid for at the Contract Unit Price for the "Supply and Installation of Thrie Beam, W-Beam Guardrails, End Terminus and Accessories". The length to be paid for will be the total number of metres of Steel Beam Guardrail Supply and Installation of Thrie Beam, W-Beam Guardrails, End Terminus and Accessories in accordance with this Specification, accepted and measured by the Contract Administrator.

E51.24 Supply and installation of ET-31 end treatments, associated posts and appurtenances will be measured on a unit basis and paid for at the Contract Unit Price for the "ET-31 End Treatment". The amount to be paid for will be the total number of units installed in accordance with this Specification, accepted and measured by the Contract Administrator.

E52. SALVAGED GUARDRAIL

DESCRIPTION

E52.1 Further to CW 3650 – Installation of Aluminum Balanced Barrier, this Special Provision provides additional requirements for the dismantling, handling, transportation, and final disposition of salvaged guardrail materials.

SALVAGING AND HANDLING REQUIREMENTS

E52.2 Further to CW 3650, Section 9.0 – Removal and Salvage of Existing Barrier Rail, the following shall apply:

E52.2.1 Dismantling and Bundling

(a) The Contractor shall fully dismantle the existing Aluminum Balanced Barrier (ABB) system, ensuring that all components, including bolts, clamps, posts, and rails, are completely separated before transport.

(b) Salvaged components shall be bundled together by type (e.g., rails, posts, hardware) for ease of handling, storage, and inspection.

(c) Large sections of assembled rail shall not be transported as a single unit; all sections must be broken down into individual components before delivery.

E52.2.2 Transportation and Delivery

(a) Further to CW 3650, Section 9.4, the following shall apply:

(i) All salvaged materials deemed reusable shall be delivered to the City of Winnipeg Bridge Yard, attention Mike Terleski, unless otherwise directed by the Contract Administrator.

(ii) The Contractor shall ensure all materials are securely transported to avoid damage or contamination.

E52.2.3 Disposal of Non-Reusable Materials

(a) Further to CW 3650, Section 9.5, the following shall apply:

(i) Salvaged materials determined to be unsuitable for reuse by the Contract Administrator shall be disposed of at an approved off-site disposal facility at the Contractor's expense.

(ii) The Contractor shall provide a list of materials designated for disposal and obtain approval prior to removal.

(iii) If an alternative use is proposed for salvaged materials, approval must be obtained from the Contract Administrator before proceeding.

MEASUREMENT AND PAYMENT

E52.3 Further to CW 3650, Sections 12.6 and 13.6, the following shall apply:

(a) No separate measurement will be made for dismantling, bundling, or transporting salvaged materials.

(b) Payment for salvaging existing guardrail shall be included in the contract unit price per meter for "Salvaging Existing Barrier Rail" and per unit for "Salvaging Existing Barrier Posts".

(c) No separate payment shall be made for the disposal of non-reusable materials.

E53. SIGN SUPPORT CLAMPS

DESCRIPTION

E53.1 This Specification covers all operations relating to the installation of new sign support clamps.

CONSTRUCTION METHODS

E53.2 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.

E53.3 The Contractor shall install all new sign support clamps at the locations as directed by the Contract Administrator. The City shall supply all sign support clamps.

MEASUREMENT AND PAYMENT

E53.4 All costs in connection with the installation of sign support clamps are incidental to the Contract.

E54. CHAIN LINK FENCING

DESCRIPTION

E54.1 General

(a) This Specification shall amend and supplement City of Winnipeg Specification CW 3550 and cover all operations relating to the supply and installation of new chain link fencing and gate, as herein specified and as shown on the Drawings

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

E54.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) CW 3550

E54.3 Materials

(a) Chain Link fence and Gate shall be 1830mm in height. T Chain Link fence and Gate materials shall be sized according to CW 3550 for the specified height. Gate materials shall also be in accordance to the manufacturers requirements.

(b) The Chain link fence gate shall be 9871mm wide. It shall be a Wallace and Wallace American Slide Gate or an equivalent approved in accordance with B6. Chain link fencing shall be modified as required to accommodate the chain link fence gate as shown on the Drawings.

EQUIPMENT

E54.4 General

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

CONSTRUCTION METHODS

E54.5 Gate

(a) In accordance with the Manufacturer's requirements.

QUALITY CONTROL AND ASSURANCE

E54.6 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.

E54.7 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 sample taken.

MEASUREMENT AND PAYMENT

E54.8 Chain Link Fencing

(a) Supplying and Installing chain link fencing shall be measured on a length basis and paid for at the Contract Unit Price per metre for “Chain Link Fence - 1.83 m ht, 300 mm x 1800 mm Concrete Pile”, 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.

E54.9 Chain Link Fencing Gate

(a) Supplying and Install chain link fencing gate shall be measure on a length basis and paid for at the Contract Unit Price per meter for “Chain Link Fence Gate”, 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.

E55. PARTIAL DEPTH PATCHING OF EXISTING JOINTS

DESCRIPTION

E55.1 General

E55.1.1 This specification covers the Partial Depth Patching of existing concrete pavement joints.

E55.2 Referenced Standard Construction Specifications

(a) CW 3230 – Full-Depth Patching of Existing Slabs and Joints

(b) CW 3410 – Asphalt Concrete Pavement Works

MATERIALS

E55.3 Asphalt Materials

E55.3.1 Asphalt material will be Type 1A supplied in accordance with Sections 5 and 6 of CW 3410.

E55.4 Tack Coat

E55.4.1 Tack Coat will be undiluted SS-1 emulsified asphalt.

CONSTRUCTION METHODS

E55.5 Planing of Joints

E55.5.1 Plane existing joints designated by the Contract Administrator to a minimum depth of 50 mm and a maximum of depth 90 mm to remove ravelled or deteriorated concrete. Width of joint to be planed will vary with depth.

E55.5.2 Should the depth of joint deterioration exceed the maximum indicated, as determined by the Contract Administrator, the entire joint shall be renewed and paid for in accordance with CW 3230 as a full depth joint repair. Planing completed shall be paid for in accordance with Section E55.7 of this specification.

E55.5.3 Dispose of material in accordance with Section 3.4 of CW 1130.

E55.6 Placement of Asphalt Material

E55.6.1 Prior to placement of asphalt material, the planed joint shall be swept or blow clean of any loose material.

E55.6.2 Apply Tack Coat uniformly on the entire surface of the planed joint. The application rate shall not exceed 0.23 litres per square metre. The planed joint shall be dry prior to applying the tack coat.

E55.6.3 Place and compact asphalt material in accordance with Section 9.3 of CW 3410 to the satisfaction of the Contract Administrator. The finished elevation of the patch shall be flush with surrounding pavement surface.

E55.6.4 Compact the asphalt material to an average 95% of the 75 blow Marshall Density of the paving mixture with no individual test being less than 90 %.

E55.6.5 Ensure that no traffic is allowed to travel over the patched area until the asphalt has cooled to atmospheric temperature.

MEASUREMENT AND PAYMENT

E55.7 Partial Depth Planing of Existing Joints

E55.7.1 Partial Depth Planing of Existing Joints will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Partial Depth Planing of Existing Joints”. The area to be paid for will be the total number of square metres of joints planed in accordance with this specification, accepted and measured by the Contract Administrator.

E55.8 Asphalt Patching of Partial Depth Joints

E55.8.1 Asphalt Patching of Partial Depth Joints will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Asphalt Patching of Partial Depth Joints”. The area to be paid for will be the total number of square metres of joints patched in accordance with this specification, accepted, and measured by the Contract Administrator.

E56. RAKED ASPHALT

DESCRIPTION

E56.1 General

E56.1.1 This specification covers the construction of raked asphalt in medians and ramp gores.

E56.1.2 Referenced Standard Construction

(a) CW 3110 – Sub-Grade, Sub-Base, Base Course Construction

(b) CW 3410 – Asphaltic Concrete Pavement Works.

MATERIALS

E56.2 Storage and Handling

E56.2.1 Store and handle material in accordance with Section 5.2 of CW 3410.

E56.3 Supply of Asphalt Concrete Paving Mix

E56.3.1 The Asphalt Concrete Paving Mix shall be Type 1A in accordance with section 7 of CW 3410.

CONSTRUCTION METHODS

E56.4 General

E56.4.1 Construct raked asphalt in the median of Lagimodiere Boulevard where noted on the drawings and as directed by the Contract Administrator. The raked asphalt shall be placed only after the concrete median swale and shoulder asphalt is completed.

E56.4.2 Excavate median soil 200mm below finished grade.

E56.4.3 Compact the subgrade.

E56.4.4 Supply and install 150mm of Base Course Material - Granular A.

E56.4.5 Supply and place 50mm of Type 1A asphalt loosely on the base course layer. Rake asphalt to provide a straight line between the top of the concrete swale and top of the inner finished asphalt shoulder. Once initial raking has occurred, a screed shall be used to achieve a straight line. Upon achieving a straight line, the final surface shall receive a second raking to finish with a coarse surface that does not vary +/- 25 mm from the straight line. The asphalt is not to be compacted but rather left to cool as placed.

MEASUREMENT AND PAYMENT

E56.5 Construct Raked Asphalt

E56.5.1 Construct Raked Asphalt will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Raked Asphalt”. The area to be paid for shall be the total number of square metres of Raked Asphalt supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

E56.5.2 Excavation, sub-grade compaction and supply and placement of base course material will be measured and paid for in accordance with CW-3110.

E57. MIX DESIGN PROPORTION

E57.1 General

E57.1.1 Further to CW 3310-R18, this Specification covers the mix proportion for all concrete types related to, the construction of Portland Cement Concrete pavements, curbs, gutters, private approaches, bull-noses, median slabs, medians, safety medians and boulevard splash strips, sidewalks and other related concrete works.

E57.2 Referenced Standard Construction Specifications

(a) CW 3310 – Portland Cement Concrete Pavement Works

E57.3 Mix Design

E57.3.1 Further to CW 3310-R18 Table CW 3310.5, the minimum cementitious contents shall be as follows:

(a) Type 1 - 380 kg/m^3
(b) Type 2 - 360 kg/m^3
(c) Type 3 - 380 kg/m^3
(d) Type 4 - 380 kg/m^3
(e) Type 5 - 340 kg/m^3
(f) Type 6 - 360 kg/m^3

E57.4 Requirements

E57.4.1 The Mix Design Statements for all the concrete shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval.

E57.5 Quality Assurance

E57.5.1 The Contract Administrator shall ensure the frequency and number of quality assurance tests in accordance with CW 3310.

E58. LONGITUDINAL JOINT AND CRACK FILLING

DESCRIPTION

E58.1 This specification shall supplement CW 3250 “Joint and Crack Maintenance”.

MATERIALS

E58.2 Longitudinal joint and crack filler to be as per Section 2.2 “Longitudinal Joint and Crack Filler (greater than 25mm width)”.

CONSTRUCTION METHODS

E58.3 Add the following to section 3.2 “Crack Cleaning”:

(a) Remove old filler material that is no longer adhered to the asphalt pavement to the satisfaction of the Contract Administrator. At completion of the asphalt planing, the Contract Administrator will mark out lengths of old filler material that is to be removed.

MEASUREMENT AND PAYMENT

E58.4 As outlined in section 4 “Measurement and Payment”.

E59. TOPSOIL AND FINISH GRADING FOR ESTABLISHMENT OF TURF AREAS

GENERAL CONDITIONS

E59.1 This specification shall supplement CW 3540 Topsoil and Finish Grading for Establishment of Turf Areas.

E59.2 Unless otherwise stated herein, all provisions of CW 3540 shall apply.

DESCRIPTION

E59.3 This work shall consist of the stripping, stockpiling, importing, placement, grading, and fertilizing of topsoil to support turf establishment in designated areas, as shown on the drawings and as directed by the Contract Administrator.

AREA SPECIFIC TOPSOIL REQUIREMENTS

E59.4 High Embankment Areas

(a) The contractor shall strip, stockpile, and replace on site topsoil to the extent available.

(b) Measurement:

(i) On site topsoil: measured by survey before and after stripping (volume)

(ii) Imported topsoil: measured by weight (tonnes)

(c) The contractor shall use all the stripped topsoil until exhausted. Any excess shall be paid as Waste Excavation. Any shortfall shall be supplemented with imported topsoil.

E59.5 Lagimodiere - Ravelston Pathway

(a) The contractor shall strip and dispose of existing topsoil. The material shall be treated as waste and paid under Waste Excavation.

(b) The contractor shall supply and place imported topsoil and sod. Topsoil shall be incidental to Sodding.

E59.6 Concordia Pathway

(a) Sod Area:
  (i) All topsoil shall be imported and considered incidental to the sod item.
  (ii) No reuse of on-site topsoil permitted.

(b) Seed Area:
  (i) The contractor shall strip, stockpile, and replace on site topsoil to the extent available, and supplement with imported topsoil as needed.
  (ii) Measurement:
    (i) On site topsoil: measured by survey before and after stripping (volume)
    (ii) Imported topsoil: measured by weight (tonnes)

E59.7 NE Loop Ramp Ditch, Median and Gore Areas

(a) The contractor shall strip existing topsoil and dispose of it as Waste Excavation.

(b) The contractor supply and place imported topsoil and sod. Topsoil shall be incidental to Seeding and Sodding.

MATERIALS

E59.8 On-Site Topsoil

DESCRIPTION

(a) On-Site Topsoil shall consist of excavating, hauling and stockpiling surface material obtained from within the right-of-way limits, stripped in advance of embankment construction, and reused as topsoil for turf establishment. The material shall not be classified as Waste Excavation or Grubbing, and shall be placed in accordance with this Specification.

METHOD OF MEASUREMENT

(b) Topsoil Excavation will be measured, and the volume computed from cross sections taken before the topsoil excavation has started and again after it has been completed.

BASIS OF PAYMENT

E59.9 On Site Topsoil will be paid for at the unit price for “On-Site Topsoil”, measured as specified herein, which price shall be payment in full for performing those operations described herein and those incidental to the work.

E59.10 Notwithstanding CW 3540, Section 5.1 and 5.2, on-site salvaged topsoil shall not be subject to testing for chemical composition or salinity. The following shall apply:

(a) The topsoil shall be shredded or screened prior to placement to ensure a friable and uniform condition.

(b) All organic and mineral components shall be considered acceptable unless determined otherwise by the Contract Administrator.

(c) Fertilizer application shall still be required in accordance with CW 3540, section 5.3.

E59.11 Imported Topsoil

(a) Imported Topsoil shall conform to CW 3540, sections 5.1 through 5.3 in full, including all testing, composition and handling requirements.

(b) On-Site Topsoil which has been stockpiled is to be reused once it is shredded and that it meets the requirements specified above for topsoil.

CONSTRUCTION METHODS

E59.12 On-Site Topsoil

(a) Where clearing or grubbing is required, it shall be performed in advance of On-Site Topsoil. The contractor shall not commence topsoil excavation in an area until the Contract Administrator has indicated that the necessary measurements have been taken. Topsoil shall be removed from designated excavation areas in advance and be maintained away from where the roadway embankment is being constructed, stockpiled where it will not interfere with roadway construction or drainage. Where no area is available within the right-of-way, the Contractor shall, at his own expense, provide suitable areas for stockpiling on adjacent land.

(b) When the ditch bottoms and slopes have been trimmed, and the Contract Administrator has completed final cross sections for the Common Excavation quantity, the Contractor shall load, haul and uniformly place a minimum depth of 75 mm of topsoil over the slopes and ditch bottoms to the satisfaction of the Contract Administrator.

E59.13 Placing Topsoil

(a) The contractor shall not commence stripping until cross-sections are taken by the Contract Administrator.

(b) Stripped material shall be stockpiled within the right-of-way or, if unavailable, on adjacent land arranged by the Contractor, subject to approval by the Contract Administrator.

(c) After final trimming, the stripped topsoil shall be re-spread over approved areas to the specified 75 mm depth.

(d) Placement shall only occur on surfaces approved by the Contract Administrator.

(e) Notwithstanding CW 3540, section 9.3, the compacted topsoil depth in all areas whether for sodding or seeding, shall be 75 mm (minimum compacted depth). No areas shall receive 100 mm topsoil depth.

E59.14 Imported Topsoil

(a) Imported Topsoil shall be used only:
  (i) Where on-site material is insufficient or unavailable
  (ii) In areas designated on the Drawings or by the Contract Administrator

(b) Placement shall match the same 75 mm depth requirement and follow the grading and rolling requirements on CW 3540.

E59.15 Fertilizer Application

(a) Fertilizer shall be applied to both on-site and imported topsoil in accordance with CW 3540, section 9.4, at the prescribed N-P-K ratio and rate.

E59.16 Finished Grading

(a) The final surface shall be smooth, uniformly graded and compacted to ensure positive drainage and surface stability in accordance with CW 3540, section 9.5.

(b) Further to CW 3540, section 9.2, all areas to receive topsoil shall be scarified to a minimum depth of 75 mm, unless otherwise noted on the Drawings.

(c) All topsoiled areas shall be rolled and graded to achieve a uniform surface, resistant to deep foot-printing, and in accordance with CW 3540, section 9.5

METHOD OF MEASUREMENT

E59.17 Nothwithstanding section 12 of CW 3540, the following shall apply:

E59.18 On-Site Topsoil

(a) Topsoil Excavation and Placement (on-site) shall be measured in cubic metres, calculated from cross-sections taken before and after stripping.

E59.19 Imported Topsoil

(a) Imported Topsoil Supply and Placement shall be measured in tonnes, based on weigh scale tickets provided at delivery.

BASIS OF PAYMENT

E59.20 Nothwithstanding section 12 of CW 3540, the following shall apply:

E59.21 On-Site Topsoil

(a) Payment shall be made at the Contract Unit Price for:
  (i) "On-Site Topsoil Excavation and Placement" per cubic metre.
  (ii) This payment shall include:
    (i) Stripping, hauling, stockpiling, shredding/screening, and re-spreading
    (ii) Fertilizer application
    (iii) Finish grading and clean-up
    (iv) All operations incidental to the Work

(b) Payment Phasing: Notwithstanding the placement timing, payment On-Site Topsoil Excavation and Placement shall be made in two parts:
  (i) Seventy (70%) of the contract unit price shall be paid upon completion of stripping and stockpiling of on-site topsoil, as accepted by the Contract Administrator.
  (ii) The remaining thirty (30%) shall be paid upon final placement of the topsoil.

No additional compensation shall be made for stockpiling or delayed placement.

Notwithstanding CW 3170, Topsoil Excavation shall not be measured or paid for separately under that Specification. All stripping, hauling, stockpiling, and placement of topsoil shall be included and paid under this Specification as "On-Site Topsoil Excavation and Placement."

E59.22 Imported Topsoil

(a) Payment shall include:
  (i) Supply, testing, delivery, placement, fertilizer application, grading, and clean-up
  (ii) All operations incidental to the work

(b) Note: Where imported topsoil is used in areas designated for sodding, the cost of topsoil shall be considered incidental to the sodding and will not be paid separately under this item.

E60. SEEDING

DESCRIPTION

E60.1 Further to CW 3520 and CW 3540, this specification describes seeding performed by the City of Winnipeg Naturalist Services and seeding performed by the Contractor. All clauses within CW 3520 and CW 3540 apply unless specifically addressed within this specification.

E60.2 This specification includes two distinct components:

(a) Seeding by City of Winnipeg Naturalist Services
  (i) Contractor will not be required to supply, place or maintain seed in areas shown on the drawings that is indicated to be seeded by City of Winnipeg Naturalist Services.

(b) Seeding by Contractor
  (i) The contractor shall supply, place and maintain seed in all areas as shown on the Drawings other than the areas designated for Naturalist Services.

MATERIALS

E60.3 Contrary to CW 3520 Section 5.2 the topsoil shall be supplied in accordance with Specification E59 - Topsoil and Finish Grading for Establishment of Turf Areas.

E60.4 Contrary to CW 3520 Section 5.3 the Contractor shall supply a salt tolerant grass seed that has a mixture composed of:

(a) Seventy percent (70%) Fults or Nuttals Alkaligrass (Puccinellia spp.), twenty percent (20%) Audubon or Aberdeen Creeping Red Fescue and ten percent (10%) Perennial Ryegrass

EQUIPMENT

E60.5 Scarification equipment shall be suitable for the area being scarified, shall be capable of scarifying the sub-grade to the specified depth and shall be accepted by the Contract Administrator. For confined areas a toothed bucket may be acceptable. For larger areas tilling equipment may be required.

CONSTRUCTION METHODS

E60.6 Preparation of Existing Grade

E60.6.1 Prior to placing topsoil, in areas to be seeded greater in width than 600mm, prepare the existing sub-grade by scarifying to a minimum depth of 75mm and to a maximum depth of 100mm to the satisfaction of the Contract Administrator.

E60.6.2 Scarification shall consist of breaking up and loosening the sub-grade. No scarification shall occur within the edge of a tree canopy (or drip line).

E60.7 Topsoil

E60.7.1 In areas where Naturalist Services or the Contractor supplies and places seed, the Contractor shall supply and place topsoil (either On-Site Topsoil or Imported Topsoil, as directed by the Contract Administrator) in accordance with Specification E59 - Topsoil and Finish Grading for Establishment of Turf Areas.

E60.8 Salt Tolerant Grass Seed shall be sown at a rate of 2.2 kilograms per 100 square meters.

E60.9 In areas where Naturalist Services or the Contractor supplies and places seed, the Contractor shall supply and place erosion control blanket upon conclusion of seeding by Naturalist Services or the Contractor and as directed by the Contract Administrator and in accordance with E47 Erosion Control Blanket.

E60.10 Maintenance of Seeded Area

(a) The Contractor shall not be responsible for maintenance in areas seeded by Naturalist Services.

(b) The Contractor shall be responsible for maintaining in areas seeded by the Contractor.

METHOD OF MEASUREMENT

E60.11 Seeding will be measured in accordance with CW 3520 Section 12.1.

BASIS OF PAYMENT

E60.12 Contrary to CW 3520 Section 5.2, topsoil shall be supplied and paid for in accordance with the Specification E59 - Topsoil and Finish Grading for Establishment of Turf Areas and will not be considered incidental to seeding. All other payment terms and conditions apply as indicated in CW3520.

E61. CONCRETE CURBS, CURB AND GUTTER, AND SPLASH STRIPS

DESCRIPTION

E61.1 This Specification shall supplement and amend CW 3310-R19 – "Portland Cement Concrete Pavement Works" and CW 3240 – "Renewal of Existing Curbs".

E61.2 The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labor, materials, equipment, tools, supplies and all things necessary for an incidental to the satisfactory performance and completion of all work hereinafter specified.

E61.3 MATERIALS

E61.4 All materials shall be as specified in CW 3310-R17.

CONSTRUCTION METHODS

E61.5 Concrete curbs, Curb and Gutter, and Splash Strips

(a) Concrete Curbs not included in CW 3310-R17 shall be constructed to the dimensions and locations shown on the Drawings and Appendix 'I'.

(b) Reinforcing steel shall be installed as per the Drawings and Appendix 'I' or as directed by the contract Administrator.

MEASURMENT AND PAYMENT

E61.6 Concrete curbs 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.

Items of Work:

(a) Construction of Type 1 Mountable Curb and Gutter (120 mm reveal ht.)

(b) Construction of Type 1 Modified Barrier Curb and Gutter (150 mm reveal ht.)

(c) Construction of Type 1 Lip Curb and Gutter (75 mm reveal ht.)

E61.7 Supply and installation of reinforcing steel will not be measured and shall be considered incidental to "Concrete Curbs, Curb and Gutter, and Splash Strips".

E61.8 Supply and placement of suitable site material for backfill behind new curbs shall be considered incidental to "Concrete Curbs, Curb and Gutter, and Splash Strips".

E62. ASPHALT PATCH OVER FULL DEPTH REPAIRS

DESCRIPTION

E62.1 Further to CW 3230 – Full Depth Patching of Existing Slabs and Joints, supply and placement of asphalt patching to the level of the milled surface will be incidental to the Works. No extra payment will be made.

CONSTRUCTION METHODS

E62.2 Full Depth Concrete Repairs

(a) Place asphaltic concrete over the newly constructed slab repair where there is a minimum of 20 mm elevation difference between repair surface and adjacent pavement surface. Remove any loose or debonded asphalt at the slab perimeter and place new asphaltic concrete in these areas as well.

(b) Prior to placement of asphaltic concrete patching material, ensure surface is clean and dry.

(c) Prepare the slab surface with a uniform application of Tack Coat applied in small quantities sufficient to wet the concrete surface.

(d) Place and compact asphaltic concrete over the slab repair in accordance with CW 3410-R8 Clause 9.3 and to the satisfaction of the Contract Administrator so that the finished elevation of the patch is flush with surrounding asphalt surface.

(e) Compact the asphalt material to an average ninety-five percent (95%) of the 75 blow Marshall Density of the paving mixture with no individual test being less than ninety percent (90%).

(f) Ensure that no traffic is allowed to cross the patched area until the asphalt has cooled to atmospheric temperature.

DRAINAGE WORKS

E63. LAND DRAINAGE SEWERS

DESCRIPTION

E63.1 General

(a) This specification covers supply and installation of land drainage sewers, catch basins, manholes and connections to existing catch basins and manholes including fittings, appurtenances and related work.

(b) To be completed in accordance with CW 2130.

MATERIALS

E63.2 General

(a) Materials to be in accordance with Form B and as shown on the drawings.

(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.

MEASUREMENT AND PAYMENT

E63.3 Measurement and payment to be in accordance with CW 2130.

E64. INSTALLATION AND ABANDONMENT OF CULVERTS

DESCRIPTION

E64.1 General

(a) This Specification covers the supply and installation of culvert pipe, couplers and fittings for connections, removal, disposal, and abandonment of culvert pipe.

(b) To be completed in accordance with CW 3610, unless indicated otherwise on the Contract Drawings.

E64.2 MATERIALS

E64.3 General

(a) Materials to be in accordance with Form B and as shown on the drawings.

(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.

E64.4 MEASUREMENT AND PAYMENT

E64.5 Measurement and payment to be in accordance with CW 3610.

E65. RIPRAP

DESCRIPTION

E65.1 This Specification covers all operations necessary for placing riprap as shown on the drawings or determined by the Contract Administrator. This Specification amends and supplements Standard Specification CW 3615.

MATERIALS

E65.2 General

(a) Materials to be in accordance with Form B and as shown on the drawings.

E65.3 Random Stone Riprap

(a) Hard, durable crushed rock that is resistant to the action of water and frost and suitable in all respects for the purpose intended, and in accordance with CW 3615.

(b) Rock for use in random stone riprap shall be well graded with rock as specified on the drawings.

(c) Rock shall be comprised of crushed limestone, granite, or other quality dense rock. Limestone shall be durable white crystalline limestone. Softer buff to yellow dolomite or dolostone will not be acceptable. Crushed rock will not be acceptable.

(d) Riprap must conform to the following physical requirements:

(i) minimum bulk specific gravity of 2.6 (ASTM C127)

(ii) maximum Los Angeles abrasion loss of 35% (ASTM C131)

(iii) maximum soundness loss of 13% (ASTM C88)

(e) Rock samples shall either be submitted to the Contract Administrator for approval ten (10) days prior to their use, or the Contract Administrator shall visit the quarry for inspection a minimum of ten (10) days prior to use. No rockfill will be permitted without providing the source and supplier. The Contract Administrator shall perform the necessary tests to determine compliance with the specified properties.

E65.4 Riprap Gradation

(a) Gradation to meet following size distribution for use intended:

Stone Size smaller than (mm)	Class 200*	Class 350
350		100%
200	100%	15-20%
125	15-20%	
100		0-15%
50	0-15%	

*Non-standard gradation to Manitoba Transportation and Infrastructure (MTI) Specification No. 1297 'Specifications for Stone Rip-Rap'.

E65.5 Geotextile Underlay

(a) Geotextile shall be a non-woven geotextile fabric, meeting or exceeding the properties specified for Separation Geotextile Fabric of CW 3130 clause 2.5.

CONSTRUCTION METHODS

E65.6 Riprap shall be installed to the elevations, grades, thickness and dimensions as shown on the Drawings, or as directed by the Contract Administrator.

E65.7 Install geotextile underlay where shown on the drawings. Overlap layers a minimum of 600 mm.

E65.8 Riprap shall be placed in a manner that prevents damage to geotextile underlay.

E65.9 Riprap shall be placed in a manner such that larger pieces are uniformly distributed, smaller rocks fill the spaces between the larger rocks, and that excessive segregation of the various rock sizes does not occur.

E65.10 Locations requiring segregated riprap or the placement of select large stones for fish passage, sediment passage or energy dissipation as indicated on the drawings.

E65.11 Existing large boulders on site will be relocated onto the new riprap as directed by the Contract Administrator

MEASUREMENT AND PAYMENT

E65.12 Supply and installation of riprap will be measured on a volume basis, based on the total number of cubic metres for each specified depth of riprap supplied, delivered and placed in accordance with this Specification and as accepted by the Contract Administrator. Payment shall be at the Contract Unit Price for "Supply and Install Riprap" for each class of riprap.

E65.13 Geotextile underlay will be measured on an area basis. Based on the total number of square metres of geotextile coverage area supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator. Payment shall be at the Contract Unit Price "Riprap Geotextile Underlay".

E66. CULVERT BAR SCREENS

DESCRIPTION

E66.1 This Specification covers the special requirements for culvert bar screens.

MATERIALS

E66.2 Culvert Bar Screen

(a) Shop drawings shall be submitted for culvert bar screens indicated on the drawings.

(b) Galvanizing shall be hot-dip conforming to requirements of CSA G164-N1981 to a minimum net retention of 600 g/m2. All bolts and nuts shall be typical steel, conforming to ASTM A-320 Grade B8M. All welding shall be fully approved by the Canadian Welding Bureau in conformance with CSA Standard W47.1. Welding shall be done by currently licensed welders only. Welding splatter and other fabricator burrs, where exposed, shall be ground off and/or filed smooth, and left ready for subsequent operations. All miscellaneous metal, after fabrication, shall be hot-dip galvanized. No separate measurement will be made for hot-dip galvanizing.

MEASUREMENT AND PAYMENT

E66.3 Culvert Bar Screens shall be measured on a unit basis for each size and configuration of bar screen supplied and installed. Culvert bar screens shall be paid for at the Contract Unit Price per unit, measured as specified herein, 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.

E67. CLEANING OF EXISTING DITCHES

DESCRIPTION

E67.1 This specification deals with work required to clean existing ditches identifies in the drawing package. This work includes the excavation of vegetation and other unsuitable materials and the transportation and disposal of that material to an approved disposal site, as agreed upon by the Contract Administrator.

MEASUREMENT AND PAYMENT

E67.2 Measurement for payment shall be the total number of linear metres of ditch cleaning carried out in accordance with this specification. No measurement for payment will be made for material excavated beyond theoretical lines. Areas identified by the Contract Administrator as being over-excavated shall be remedied by the Contractor at their own expense.

E67.3 Payment for Cleaning of Existing Ditches, shall be compensation in full for all labour, materials and equipment required to complete the work herein described together with the excavating, handling, hauling, placing and shaping up of all waste materials in an approved disposal area as required.

E68. PIPE ANCHOR

DESCRIPTION

E68.1 This specification describes the special requirements for pipe anchors, and shall amend and supplement Standard Specifications CW 2130 and CW 2160.

MATERIALS

E68.2 Pipe Anchor

(a) Concrete for the pipe anchor shall be Type B concrete in accordance with Table CW2160.1 of CW 2160.

(b) To limit heating and hoarding requirements during cold weather, cold weather concrete shall have a minimum compressive strength of 20 MPa 24 hours after placement and be maintained at a minimum temperature of 10°C for 3 days following installation.

(c) Reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400W, Billet-Steel Bars for concrete reinforcement. All reinforcing steel shall be straight and free from paint, oil, mill-scale, and injurious defects. Surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross section area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel.

(d) Bar accessories including bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices shall be of a type approved by the Contract Administrator. They shall be made from a non-rusting material, and shall not stain, blemish, or spall the concreted surface for the life of the concrete.

CONSTRUCTION METHODS

E68.3 Install as per this specification, the IFC drawings and as directed by the Contract Administrator.

E68.4 Materials, steel placement and formwork to be approved by Contract Administrator prior to concrete installation.

E68.5 No “stay-in-place” formwork is permitted.

MEASUREMENT AND PAYMENT

E68.6 Pipe Anchor shall be measured and paid on a per-unit basis, with each unit corresponding to a specific size and configuration of the anchor constructed. Payment for the construction of Pipe Anchors will be made at the Contract Unit Price per unit, which shall constitute full compensation for furnishing all materials, performing all necessary work, and completing all operations described in this Specification. This price shall also cover all incidental items required to complete the work.

E69. TEMPORARY IN-WATER WORKS

DESCRIPTION

E69.1 The following work is included:

(a) The construction of all Temporary In-Water Works necessary to complete the Works, in accordance with the drawings or as determined by the Contract Administrator.

(b) All other works necessary for maintaining the stability of the Works, including but not limited to stability of adjacent shorelines, site dewatering, monitoring, maintenance, disposal of unsuitable fills or deleterious materials are considered incidental to Temporary In-Water Works.

(c) Protection of fish and wildlife habitat.

(d) Site restoration.

E69.2 Definitions:

(a) Temporary cofferdam – A temporary or removeable structure to keep surrounding earth, water or both out of the construction site and construct with suitable material approved by the Contract Administrator.

SUBMITTALS

E69.3 The Contractor shall submit an In-Water Works Plan for review and approval by the Contract Administrator and all Jurisdictions having authority. The In-Water Works Plan shall:

(a) Provide all design calculations, design parameters, methods of construction, drawings and details as required to demonstrate suitability of temporary cofferdam design.

(i) Temporary cofferdams to resist all dead and live loadings, including earth pressures, hydrostatic pressures, point loads, line loads, and surcharge loads that the temporary cofferdam may experience during construction.

(b) Provide details on dewatering, erosion and sedimentation control, monitoring and maintenance of the temporary cofferdam for duration of construction.

(c) Provide details on construction staging and scheduling.

(d) Include emergency response plans for unexpected site conditions including but not limited to temporary cofferdam failures, contaminant spills or leaks, weather or high water events.

(e) Be in compliance with all appropriate agencies, permits, regulations, and codes of practice.

E69.4 Submit In-Water Works Plan at least fourteen (14) calendar days prior to start of construction of the in-water works.

EXECUTION

E69.5 Obtain the Contract Administrator's approval of In-Water Works Plan prior to Construction of the in-water works.

E69.6 All temporary cofferdams to be constructed to adequate depths and heights, be safely designed and constructed of good standards materials, and be made as watertight as necessary to complete works within the temporary cofferdam area.

(a) Temporary cofferdam height to accommodate peak seasonal flows, or highest water level expected for the duration of in-water work.

E69.7 Dimensions of the temporary cofferdam shall provide sufficient clearance for the construction and inspection of works and permit dewatering of the site as required.

E69.8 Regularly inspect and repair the temporary cofferdam as required for the duration of in-water works.

E69.9 The Owner reserves the right to require the Contractor to removal all materials from the retention pond at any time to prevent water pollution or adverse environmental effects, including bank erosion, or effects on adjacent structures.

(a) If the Contractor fails to comply with this requirement, the Owner reserves the right to make immediate separate arrangements to remove such materials, and repair or restore the site as required at the Contractor's expense.

DEWATERING

E69.10 Pumping to dewater a sealed temporary cofferdam not to commence until the seal has set sufficiently to withstand the hydrostatic pressure.

E69.11 Relocate fish, mussels, or other wildlife within the isolated area in accordance with all appropriate agencies, permits, regulations, and codes of practice. Dewater gradually to reduce potential for stranding fish.

E69.12 Discharge of water containing suspended solids or contaminates to the retention pond is not acceptable. A suitable settling basin or filter may be required to ensure only water free from suspended materials is discharged back to the retention pond.

E69.13 No pumping will be permitted during the placing of concrete or for a period of 24 hours after concrete is placed, unless pumping is done from a suitable sump separated from the concrete by a watertight wall or other effective means.

REMOVAL OF TEMPORARY COFFERDAMS

E69.14 Temporary cofferdams and all other necessary works to complete the temporary cofferdam are to be carefully removed after the completion and inspection of the Works.

E69.15 Remove temporary cofferdam work from the water and moving towards the shoreline.

E69.16 Any damage to the completed works during temporary cofferdam removal shall be repaired, and all disturbed surfaces restored to their original condition or better.

E70. PROTOCOL FOR WORKS IN CLOSE PROXIMITY TO FEEDER MAINS

DESCRIPTION

The following work is included This Section details protocols for all work to be carried out in close proximity to feeder mains. Close proximity shall be deemed to be any construction activity within a 10.0 m horizontal offset from the centerline of the feeder main.

E70.1 The following shall be considered critical pipelines and water infrastructure for this project:

(a) North Transcona Feeder Main, 610 mm Lined Cylinder type Prestressed Concrete Cylinder Pipe (PCCP) to AWWA C-301-58 (1958), originally installed in 1963. The pipe was originally designed for 3.0 m of cover.

GENERAL CONSIDERATIONS FOR WORK IN CLOSE PROXIMITY TO FEEDER MAINS

E70.2 Feeder mains are a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to feeder mains shall be undertaken with an abundance of caution. Feeder mains cannot typically be taken out of service for extended periods to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences.

E70.3 Work around feeder mains shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E70.4 Large diameter pressure pipe shall not be made to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters.

E70.5 Construction in close proximity to critical infrastructure shall not commence until both equipment lists complete with dimensions and loads and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.

E70.6 The Lagimodiere Overpass embankment was constructed between 1967 and 1969, crossing over the North Transcona Feeder Main, The pipe strength class was not designed for the embankment load and no pipe protection is believed to have been installed over or around the pipe during embankment construction. The pipe currently has about 7.6 m of cover and has been in a structurally overloaded condition for the past 55 years. Some of the prestressing wires may have corroded over time, further reducing the pipe's load carrying capacity.

E70.7 Given the overloaded condition, an extraordinary level of care should be undertaken when working near the pipe. Ensure all parties entering the worksite and especially delivery vehicles whose drivers may be unfamiliar with the job site and feeder main are made aware of the location of the pipe and these requirements.

E70.8 Failure of the pipe would wash out a portion of the overpass embankment, destroy or significantly damage adjoining roads and homes and could endanger life.

E70.9 Identify the location and elevation of the feeder main by soft excavation (hydro vac) prior to construction. The approximate top of pipe is elevation 228.75 m, but this should be confirmed with actual measurements.

E70.10 Mark and install a continuous visual barrier (i.e. snow fence) or intermittent visual indicator (stakes with flagging, poly posts) on 4.0m offset both sides of the feeder main centerline within work area.

E70.11 Works carried out near the pipes should not subject the pipes to:

(a) Excessive static loads from vehicles or material stockpiles.

(b) Excessive impact and vibrations from moving vehicles or other dynamic construction methods.

(c) Concentrated or asymmetrical loading.

(d) Drop unloading of materials.

E70.12 Construct structural crossings across the pipe where the pipe must be crossed by non-low ground pressure vehicles (e.g. rubber tire vehicles or tracked vehicle without oversized 'swamp' pads) to mitigate the potential for damaging the pipe. These crossings should consist of either:

(a) Bridging over the pipe, with no load bearing on the surface overtop or within the zone around the top of the pipe.

(b) On-ground surfacing such as timber mats, steel plates or concrete protection slabs to distribute the loading over a larger area. Rubber landscape protection mats are not suitable protection.

E70.13 Arrange pipe crossings to cross perpendicular to the pipe to minimize the length of pipe impacted. Confine equipment and vehicles to these designated crossing locations.

E70.14 Vehicles should cross the pipe at low speed. A good practice is to have vehicles come to a complete stop before crossing the pipe then proceed across slowly. These crossing practices should be managed using stop signs and flagging staff.

E70.15 Avoid driving along the pipe. Paving operations working on granular soil subgrades such as including trimming and paving operations should be configured to cross perpendicular to the pipe wherever possible.

E70.16 Structural crossings are not required for vehicles working on the top of Lagimoidere Boulevard embankment.

E70.17 Construction vehicles working on the embankment sideslopes near the feeder main should be low ground pressure tracked vehicles. Schedule construction operations to cross the pipe corridor as little as possible.

E70.18 Do not impart excessive vibration loads on the pipes or that would cause settlement of the soil around or below the pipe.

(a) No large vibratory equipment shall be used overtop or within 10.0m measured horizontally on either side of the pipes.

(b) Compact pavement subgrade, subbase and base materials by static methods without vibration or with smaller approved equipment such as hand-held plate packers or smaller roller equipment.

E70.19 Materials must not be dumped or stockpiled overtop or within 15.0m of the feeder main centerline.

E70.20 Do not park vehicles overtop of the feeder main.

E70.21 Pavement demolition and removal within 10.0m horizontally of the pipe centreline shall be completed by saw cutting and removal, or use of hand held jack hammers. Use of machine mounted concrete breakers within 5.0m of a feeder main shall not be permitted.

MEASUREMENT AND PAYMENT

E70.22 Protocol For Works in Close Proximity to Feeder Mains will be incidental to the Contract.

E71. WORKING AROUND MANITOBA HYDRO POLES

DESCRIPTION

E71.1 When excavating for the road within three (3.0) m of a Manitoba Hydro wood pole, a Safety Watch will be required. The Contractor shall provide a digger truck capable of holding the pole in place while excavation and granular subbase backfill is completed back to original grade.

(a) The digger truck to be provided by the Contractor shall be to the satisfaction of the Contract Administrator and Manitoba Hydro Safety Watch personnel; and

(b) Manitoba Hydro has provided guidance for allowable excavations around existing poles.

CONSTRUCTION METHODS

E71.2 The pole rigging sling to be provided by the Contractor shall be to the satisfaction of the Contract Administrator and Manitoba Hydro Safety Watch personnel.

E71.3 The sling is to be wrapped around the pole and connected it to the winch line of the digger truck. The sling is to be situated just above the halfway mark of the pole between ground level and the top of the pole. The reason for this is to allow the operator to have control of the pole in the event that the pole breaks (due to rot or cracks).

E71.4 Manitoba Hydro Safety Watch personnel will assist the Contractor in attaching and detaching the pole sling.

MEASUREMENT AND PAYMENT

E71.5 The Work described in this Specification will be considered incidental to “Excavation” and no measurement or payment will be made.

ELECTRICAL

E72. ELECTRICAL GENERAL REQUIREMENTS

DESCRIPTION

E72.1 General

E72.1.1 Labour, Products, equipment and services necessary for electrical general requirements Work in accordance with the Contract Documents.

E72.1.2 In general, the following summarizes Electrical Scope of Work and General Requirements. Details of Contract requirements to be in accordance with Contract Documents.

(a) Electrical distribution connection to Manitoba Hydro transformers.

(b) New grounding system in accordance with Contract Documents.

(c) New lighting replacements in accordance with Contract Documents.

(d) New CSTE’s (Customer Service Termination Enclosures) in accordance with Contract Documents.

(e) Confirm exact location and characteristics of new and existing electrical systems on Site and adjust to suit Site requirements. Advise City of Winnipeg of discrepancies. Test and commission standalone and interfaced systems to ensure proper operation. Correct deficiencies.

(f) Coordinate with City of Winnipeg for demolition and construction Work to avoid disruption of transit operation.

(g) Trace, verify and record existing circuits to existing electrical equipment and provide typed revised panelboard schedules.

(h) Equipment not indicated on Contract Drawings shall remain unless noted otherwise. Remove and reinstall electrical equipment, conduit, wire, and light fixtures, required to be moved because of interference due to installation of new equipment. Coordinate with other trades.

(i) Confirm exact locations of new and existing electrical systems on Site. Advise City of Winnipeg of discrepancies.

(j) Cut, patch and make good holes made due to electrical system installation.

(k) Prior to and during construction, coordinate with other Divisions to avoid interference of equipment and services. Ensure no services are affected by demolition Work. If services are affected by demolition Work, notify City of Winnipeg immediately.

(l) Complete inspection, start-up, testing and commissioning of installed equipment in accordance with manufacturer's recommendations and Contract Documents.

(m) Correct and complete all construction deficiencies before scheduling commissioning.

(n) Provide services of manufacturer's technical representative for commissioning at no additional cost to City of Winnipeg.

E72.2 References

(a) Use the standard version listed in the technical Sections unless replaced by updated amendment or revision.

(i) CSA C22.2 No. 94, Special Purpose Enclosures.

(ii) CSA Z462, Workplace Electrical Safety.

(iii) IEEE 1584, Guide for Performing Arc Flash Hazard Calculations.

(iv) NEMA, National Electrical Manufactures Association.

(v) Canadian Electrical Code.

E72.3 Quality Assurance

(a) Equipment and material to be of approved design and manufactured in accordance with all governing regulations such as "Canadian Standards Association", "Canadian Electrical Code", "Provincial Department of Labour", "Underwriters Laboratory", etc. Equipment and material must bear applicable acceptance labels of all associations and governing bodies recognized by the municipal, provincial and federal authorities.

(b) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection 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 approval 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.

E72.4 Approved Design and Installation

(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) Equipment and material to be of approved design and manufactured in accordance with all governing regulations such as "Canadian Standards Association", "Canadian Electrical Code", "Provincial Department of Labour", "Underwriters Laboratory", etc. Equipment and material must bear applicable acceptance labels of all associations and governing bodies recognized by the municipal, provincial and federal authorities.

(d) Install equipment in strict accordance with manufacturer's recommendations and governing rules, regulations and codes.

(e) Where requirement conflict occurs, install all materials in accordance with the most severe requirements.

(f) Material installed under this Division to be new and of uniform construction.

(g) All installations to ensure maximum headroom, minimum interference with free use of surrounding areas, and best access to equipment.

(h) To deviate major service runs from the location shown on the drawings, submit to the Engineer suitable drawings showing such deviations together with reasons for deviations and obtain approval from the Engineer before proceeding with the installation.

E72.5 Shop Drawings

(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, all shop drawings, product data, and mill certificates for materials, components and systems.

(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 scheduled Work on the Site, all wiring diagrams for the Work.

(c) The Contractor shall clearly identify specific products, component parts, and data applicable to the supply of materials. Inapplicable information shall not be included in the submission.

(d) The Contractor shall supplement product data with drawings to illustrate relations of component parts of systems.

E72.6 As-Built Drawings

(a) Submit As-Built Drawings indicating the following:

(i) Accurately maintained, dimensioned record of cable, conduit, bus duct and equipment locations in the pedestrian tunnels, bridge deck and surrounding areas. Show deviations and changes in Work from Contract Drawings.

(ii) Actual locations of conduits and ducts, piping, maintenance holes, and similar items located below or outside of structure.

(iii) On each As-Built Drawing in lower right hand corner in letters minimum 13 mm high as follows: AS-BUILT: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED followed by signature of the Contractor and date.

E72.7 Environmental Conditions

(a) Outdoor equipment, whether permanent or temporary for the execution of the Work, supplied under this Contract to be suitable for its intended use with the outdoor temperature and humidity experienced in the Winnipeg area.

E72.8 Design For Ease of Maintenance

(a) Equipment to be designed and constructed so that adjustment, replacement, repairs or regular upkeep can be easily carried out by maintenance personnel with minimum additional training and with tools normally available. The design to incorporate, where possible, the concept of modular removal and replacement of malfunctioning components.

(b) Design of the equipment to provide maximum accessibility to equipment and components to facilitate preventative maintenance checks, services and repair actions. Test points and test procedures, with values and tolerance range, to be provided to facilitate diagnosis of malfunctioning components and for check-out after repair and replacement.

E72.9 Site Conditions

(a) Protect, support and maintain existing active services as required for execution of the Work without disturbing the existing site conditions.

E72.10 Fabrication

(a) If CSA certified equipment is unavailable, obtain special approval for equipment from CSA.

(b) Provide equipment suitable for its intended use within range of temperature typical in the Winnipeg area

(c) Factory assemble control panels and other components, except for shipping splits.

(d) Fabricate steel supports, plates and hardware as required. Hot-dip galvanize prefabricated supports such as channels, brackets, hangers, and slotted angles. Do not field weld, but bolt or clamp. Touch-up cut sections with cold galvanizing zinc coating.

(e) Do not manufacture or install electrical equipment or systems until Shop Drawing reviewed and acceptance by City of Winnipeg and/or authorities having jurisdiction.

E72.11 Finishes

(a) Prepare and clean surfaces of electrical Products requiring painting in accordance with SSPC-SP1 for oil, grease, dirt and other contaminates and SSPC-SP3 for rust.

(b) Apply one coat of primer.

(c) Apply 2 coats of finish paint. Colour of manufacturer's standard ASA 61 grey exterior and interior, except as specified otherwise. Paint all electrical equipment in accordance with EEMAC standard.

(d) Apply paint in accordance with manufacturer's instructions regarding application methods, coating thicknesses, equipment, temperature and humidity conditions.

(e) Provide verification of finish standards that the finish system complies with EEMAC and industry test standards. Provide specific verification that 1000 hour (min) salt spray and humidity tests have been met.

(f) Clean and touch-up surfaces scratched or marred during shipment and installation, to match paint finish.

(g) Clean, prime and paint exposed hangers, racks and fasteners to prevent rust.

E72.12 Wiring Identification

(a) Provide permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and identification throughout system, i.e. panelboards, starters, terminal blocks, disconnect switches.

(b) Maintain identification system at all junction boxes, splitters, cabinets and outlet boxes.

(c) Use colour coded wires in communication cables, matched throughout system. All colour coding must adhere to CSA C22.1.

E72.13 Touch-Up Painting

(a) Be responsible for field touch-up painting of all shop painted electrical equipment installed in this Contract.

(b) All surfaces to be painted shall be dry, clean, free from dust, dirt, grease, frost, rust, loose crystals or extraneous matter, tool and machine marks. Feather out edges of scratch marks to make patch inconspicuous.

(c) Apply one or more coats of paint until the damaged surface has been restored to original finish condition. Do not apply succeeding coats until preceding coat is dry and hard. Sand lightly between coats with No. 00 sandpaper.

(d) Be responsible for obtaining the necessary touch-up paint of the original type and quality from the equipment manufacturer.

(e) Supervise priming and finish painting of all electrical equipment and material not shop painted.

E72.14 Examination

(a) Verify condition and dimensions of previously installed Work this Section depends upon. Report defects to City of Winnipeg. Commencement of Work means acceptance of existing conditions.

(b) Verify equipment access and coordinate with equipment supplier to ensure equipment can be physically transported to installation location.

(c) Quantities or lengths indicated in Contract Documents are approximate and do not gauge or limit Work. No adjustment to Contract Price allowed to complete the Work.

(d) Include for changes or additions to routing of conduits to accommodate structural, mechanical and architectural conditions.

E72.15 Existing Equipment

(a) Electrical equipment requiring temporary or permanent relocation or power due to construction is the Contractor's responsibility.

(i) All new and existing electrical equipment to be connected to or disconnected from existing distribution system (for example, panelboards, control panels, etc.) by City of Winnipeg forces. Contractor to coordinate Work schedule with City of Winnipeg minimum 4 weeks in advance.

(b) Provide additional items and accessories or connections obviously required to provide complete working system for relocated equipment, but omitted from Specifications or not shown on Contract Drawings.

(c) Assume existing conduits in Work area contain live circuits.

(d) Trace conduits and circuits feeding existing equipment in Work area obstructing and interfering with Work. Maintain circuits live, if required, and in use.

(e) Contractor shall coordinate with City of Winnipeg, Work related to electrical equipment requiring temporary or permanent relocation or power due to construction.

(f) Unless "only" suffixes "supply, install and connect" or variation of those words, it means "supply, install and connect".

E72.16 Installation

(a) Coordinate installation of electrical equipment with equipment of other trades. Notify other trades in advance of openings, anchors, hangers or other provisions necessary for electrical installation.

(b) Identify embedded, concealed or recessed equipment before construction. In spaces above ceilings, coordinate electrical installation with other trades, such as ductwork and piping.

(c) Install wiring and connections to equipment supplied by other trades, such as wiring and interlocks of equipment and control devices specified in other Divisions.

(d) Protect electrical equipment from the elements and damage by construction activities in area.

(e) Perform electrical Work in accordance with OBC, CEC, and CSA. Perform changes or alterations required by authorized inspectors of authorities having jurisdiction such as Manitoba Hydro.

(f) After completion of part of Work, notify City of Winnipeg to make final inspection. Make tests of such portions and promptly make any changes necessary, to the acceptance of City of Winnipeg. Place Work in service at such time and in such order as City of Winnipeg may direct.

(g) Do not reduce requirements of standards established by Contract Documents by applying codes referred to in this Division.

(h) Assemble, install, connect and adjust for complete operation of electrical equipment.

(i) Install electrical equipment in locations shown on Contract Drawings. Such locations are subject to change to suit conditions as Work progresses. Before installing equipment, obtain instructions from City of Winnipeg for exact locations, make such changes without extra cost to City of Winnipeg.

(j) Existing and new conduits, outlets, or other electrical equipment shown on Contract Drawings are not necessarily exact locations or quantities. Make allowances for additional Work of removing or installing additional conduits, outlets, as required, to accommodate Work.

(k) No change to Contract Price will be allowed for relocation of equipment incorrectly installed because of failure to check and coordinate details, Contract Drawings and interferences, prior to installation.

E72.17 Load Balancing

(a) Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record current readings. Submit recorded data to City of Winnipeg for review.

(b) Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment. Measure phase voltages to reflect utility voltage fluctuations and set accordingly.

E72.18 Care, Operation And Start-Up

(a) Instruct City of Winnipeg's staff in operation, care, and maintenance at times arranged by City of Winnipeg and detailed in other Sections at no additional cost to City of Winnipeg.

(b) Provide services of Contractor's staff to supervise startup of installation, check, adjust, balance and calibrate components at no additional cost to City of Winnipeg.

(c) Provide these services for such period and for as many visits as necessary to put installation in working order and to ensure City of Winnipeg staff is conversant with all aspects of its care and operation at no additional cost to City of Winnipeg.

E72.19 Cleaning

(a) Where equipment shows corrosion, or damage to finish of panels, panelboards fixtures or devices, touch-up surfaces to the acceptance of City of Winnipeg.

E72.20 Maintenance

(a) Carry out regular scheduled maintenance of equipment and systems following Substantial Performance until Contract Completion.

E73. WIRES AND CABLES

DESCRIPTION

E73.1 General

(a) Labour, products, equipment and services necessary for wires and cables 0 - 1000 V Work in accordance with the Contract Documents.

E73.2 References

(a) ANSI/NETA ATS-2017, Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.

(b) ASTM B3, Standard Specification for Soft or Annealed Copper Wire.

(c) ASTM B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

(d) ASTM D1047, Standard Specification for Poly(Vinyl Chloride) Jacket for Wire and Cable.

(e) CSA, Canadian Standards Association.

(f) CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables.

(g) CSA C22.2 No. 38, Thermoset-Insulated Wires and Cables.

(h) CSA C22.2 No. 49, Flexible Cords and Cables.

(i) CSA C22.2 No. 75, Thermoplastic Insulated Wires and Cables.

(j) CSA C22.2 No. 124, Mineral-Insulated Cable.

(k) CSA C22.2 No.131, Type TECK 90 Cable.

(l) NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail System.

(m) CEC, Canadian Electrical Code.

(n) UL, Underwriters' Laboratories.

(o) ULC, Underwriters Laboratories of Canada.

E73.3 Submittals

(a) Submit the following Shop Drawing(s):

(b) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists.

(c) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol.

(d) Product transportation, storage, handling, and installation requirements.

(e) Cables used on Contract.

(f) Cable terminations used on Contract.

(g) Cable supports used on Contract.

E73.4 Quality Assurance Submittal(s)

(a) Submit manufacturer's qualifications.

(b) If requested by City of Winnipeg, or if necessary to meet Site condition requirements, submit alternate cable routing information for review prior to proceeding with the Work.

E73.5 Commissioning Submittal(s)

(a) Submit Test Procedures.

(b) Submit Certificate of Readiness.

(c) Submit Test Reports.

(d) Submit Closeout Report.

E73.6 Regulatory Requirements

(a) Furnish Products listed and classified by CSA and UL as suitable for application.

E73.7 Delivery, Storage, and Handling

(a) Ship cables from manufacturer with ends temporarily sealed against moisture ingress.

(b) Store cables in clean, dry location.

(c) Uncoil cable by rolling or rotating supply reel (available from manufacturer) to ease handling and prevent possible snarling and kinking. Do not pull from coil periphery or centre.

(d) Take precautions necessary to prevent damage to cables from contact with sharp objects, including pulling over foreign objects or sheaves.

E73.8 Site Conditions

(a) Verify field measurements and conditions as required by Contract Documents.

(b) Cable routing on Contract Drawings is approximate unless fully dimensioned. Route cable as required to suit Site conditions and as reviewed by City of Winnipeg.

(c) Where cable routing is not shown and destination only is indicated, determine exact routing and lengths required to suit Site conditions and as reviewed by City of Winnipeg.

E73.9 Coordination

(a) Coordinate Work specified in this Section with Work provided under other electrical Sections and Work of other trades.

(b) Determine required separation between cable and other Work.

(c) Determine cable routing to avoid interference with other Work.

(d) Provide core drilling where required prior to commencing Work.

(e) Coordinate alternate cable routing with City of Winnipeg prior to proceeding with the Work.

E73.10 Manufacturers

(a) Electro Cables Inc.

(b) General Cable, a company of the Prysmian Group.

(c) Nexans Canada Inc.

(d) RSCC Wire and Cable LLC.

E73.11 Low Voltage Cables

(a) Minimum 600 V insulation.

(b) Conductors: No. 12 AWG (3.31 mm2) through to No. 8 AWG (8.38 mm2) stranded copper wire. Nylon jacketed and thermoplastic insulated T90 and TWU90 unless indicated otherwise in Contract Documents.

(c) Copper conductors: Size #6 and larger, RW90 and RWU90 as indicated on Contract Drawings with 600 V (for 208 V feeder) and 1000 V (for 600 V feeder) rated thermosetting cross-linked polyethylene (XLPE) insulation.

(d) Wires and cables free of splices between terminations. If physical constraints of installation prevent this, details of splicing are subject to approval by City of Winnipeg.

(e) Colour coding as follows:

(i) 1 Conductor, 1 phase: Black.

(ii) 2 Conductor, 1 phase: Black, White

(iii) 3 Conductors, 3 phase: Red, black, and blue.

(iv) 4 Conductors, 3 phase: Red, black, blue, and white.

(v) Ground Conductor: Green.

E73.12 Wiring Accessories

(a) Wire markers: computer printed, black letters on white background, self-laminating – vinyl markers, number of markers as required.

(b) Cable markers for cables or conductors greater than 13 mm diameter: strap-on type, rigid PVC, black letters on white background, with PVC covered aluminium straps.

(c) Terminal blocks: minimum 600 V rated, modular, sized to accommodate conductor size used.

(d) Where screw-type terminals are provided on equipment field wiring: terminate with pressure-type insulated copper fork tongue terminals.

(e) Splice connectors for wire sizes Nos. 12-10 AWG inclusive: compression spring type.

(f) Splice connectors for wire sizes No. 8 AWG and larger: split-bolt type, sized to suit number and size of conductors, c/w flame retardant foot-type insulator.

(g) Cable ties shall be nylon, one-piece, self-locking type.

(h) Connectors for Teck armoured cables installed in hazardous locations: design approved for the application.

(i) Connectors for Teck armoured cables installed in wet areas or outdoors: watertight design.

(j) Cable pulling lubricant: compatible with cable covering and will not cause damage and corrosion to conduits or ducts.

(k) Verify cable end factory temporary seals remain intact, insulation has not been exposed to air, and no moisture has entered cable insulation.

(l) Verify completion of Work by other trades likely to damage cable.

E73.13 Wiring Methods

(a) Use wiring methods indicated on Contract Drawings, manufacturer's instructions, and as specified herein.

(b) When cables are cut in field, seal exposed end using standard sealing compound and PVC tape in accordance with cable manufacturer's recommendation.

E73.14 Installation of Wires and Cables

(a) Carefully pull in all wires in any one conduit at same time directly from reels or coil in accordance with cable manufacturer's recommendations. Avoid damage to conductors or insulation.

(b) Joints are not permitted in conductors between boxes or outlets. Ensure neutral conductors are unbroken throughout their length and feeders are continuous without splices throughout their entire length unless splices permitted by City of Winnipeg.

(c) Use proper crimping tool on pressure-applied specific connectors at conductor joints.

(d) Designate wire and cable circuits at distribution panelboards and switchboards by correct specified fibre tag.

(e) Use terminal lugs on conductors No. 10 AWG (5.26 mm2) or larger where they are terminated for connection to switchboard or other equipment. Apply lugs with manufacturer's recommended tools.

(f) Carefully unroll cable from reels and coil and run cable as complete from one outlet or junction box to next.

(g) Seal space between cables and sleeves or wall or floor opening with UL-listed firestop putty, sealant, compound, or pillow, after wires and cables have been installed.

(h) If necessary to splice cable, make splice in junction box sized to suit cable thickness in accordance with CEC. Keep the number of splices in any run of cable to a minimum consistent with available coil length and installation conditions.

(i) If City of Winnipeg determines that an excessive number of splices have been made in a run of cable, remove, replace, and splice cable as directed by, and at no additional cost to, City of Winnipeg.

(i) Support cables on clips at maximum spacing of 1 m. Make bends in cable with manufacturer's recommended tools to the following minimum radii measured inside bend.

SHEATH DIAMETER (OD)	MINIMUM BENDING RADIUS
Above 19 mm and including 38 mm	12 x sheath diameter
Above 38 mm	15 x sheath diameter

(j) Straighten cable runs to form a neat and uniform appearance. Route cables, where possible, parallel to or at right angles to walls, ceilings, and floors. Where this is not possible, seek permission from City of Winnipeg.

(k) Carry conductors of branch circuits or feeders in same multi-conductor cable, unless otherwise noted or reviewed by City of Winnipeg.

(l) Identify at both ends utilizing permanent markers.

(m) Install wiring as follows:

(i) In conduit systems.

(ii) In underground ducts.

(n) Where wire size has been increased to compensate voltage drop, make reductions to wire size only at terminal lugs. In accordance with CEC, do not reduce wire size below rated circuit ampacity.

E73.15 Field Quality Control And Commissioning

(a) Inspect cable for physical damage and proper connection.

(b) Verify continuity of each conductor.

(c) Obtain cable manufacturers' certification that installation is in accordance with their requirements. Pay all applicable fees.

(d) Test conductors for continuity, short circuits, and grounds. Ensure resistance to ground is not less than 50 megohms.

(e) Pre-acceptance tests:

(i) After installing cable, but before splicing and terminating, perform insulation-resistance test on each conductor with respect to ground and adjacent conductors.

(ii) Check insulation resistance after each splice to ensure cable system is safe and ready for termination.

(iii) During testing ensure terminations and accessory equipment are disconnected.

(f) Acceptance tests:

(i) Verify wiring terminations and cable torque measurements to ensure interconnections are in accordance with Contract Documents.

(g) If cable fails to meet any of the test criteria, remove and replace entire length of cable at no additional cost to City of Winnipeg.

E73.16 Measurement and Payment

(a) Supplying and Installing Wires and Cables shall be measured on a length basis and paid for at the Contract Unit Price per metre for "Supply and Install Wires and Cables", 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.

E74. GROUNDING AND BONDING

DESCRIPTION

E74.1 General

(a) Labour, Products, equipment, testing and services necessary for grounding and bonding Work in accordance with the Contract Documents.

E74.2 References

(a) CAN/CSA-B72-M, Installation Code for Lightning Protection Systems.

(b) CSA C22.2 No. 31, Switchgear Assemblies.

(c) CEC, Canadian Electrical Code.

E74.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data, supplemented by bulletins, component illustrations, detailed views, technical description of items and parts list.

(ii) Ground electrode, ground electrode boxes, ground connector, lightning rod, stand-off insulator, resistor elements and ground conductor.

E74.4 Quality Assurance Submittal(s):

(a) Submit test results of grounding system continuity and resistance.

E74.5 Commissioning Submittal(s):

(a) Submit Test Procedures.

(b) Submit Certificate of Readiness.

(c) Submit Test Reports.

(d) Submit Closeout Report.

E74.6 Manufacturers

(a) Thomas and Betts.

(b) Burndy.

(c) Dossert.

(d) Hubbell.

(e) Erico.

E74.7 Grounding and Bonding Conductors

(a) Grounding and bonding conductors: In accordance with CEC.

(b) Conductors shall be concentric stranded, soft drawn copper. Insulated conductors, where required by Inspection Authorities or specified, shall be type TW, 600-volt rating, green colour, and shall meet the same flame-spread requirements of all wiring in the area and conditions where they are installed.

(c) Conductors shall be sized at least per the requirements of the latest version of the Canadian Electrical Code and of the local Authority, or as indicated, whichever is the greater size.

(d) Where direct buried bare ground conductor comes into contact with corrosive material, the conductor shall be tinned.

E74.8 Ground Rods

(a) Ground rods: 19 mm diameter x 3050 mm long, copper bonded with minimum 10 mil copper coating.

E74.9 Electrical Safety Grounding

(a) Supply means for permanent and effective electrical grounding of exposed non-current-carrying metal parts, assemblies housing electrical current carrying components (switchgear and transformer), as required by the CEC and Contract Drawings.

(b) Additional grounding requirements of the electrical equipment in accordance with CSA C22.2. No. 31-18 and Occupational Health and Safety Act and Regulations for Construction Projects.

(c) All electrical distribution and control equipment doors to have flexible ground bonding braid to extend ground from equipment ground bus bar and not rely on hinge.

(d) Supply effective grounding of exposed non-current-carrying metal structures like doors, frames, supports etc. Doors and moving parts to have flexible ground bonding braid extended from the ground bus bar and not rely on hinge

E74.10 Installation

(a) Provide ground rods, grounding conductors, bonding and tap connections in exterior and interior for complete grounding system in accordance with Contract Drawings.

(b) Bond metallic conduits, boxes, and non-current-carrying metal parts of equipment together to form continuous grounded system.

(c) Minimum burial depth for underground or buried ground loops and interconnections 450 mm.

(d) Install grounding conductors without damage, do not dislodge or displace during construction Work. Install conductors with enough slack to prevent breaking stresses.

(e) Install ground connections within boxes in locations accessible for inspection.

(f) Install separate ground conductor in all conduits sized to CEC unless noted otherwise.

(g) Terminate neutral return conductors from 600 V/208 V distribution sections on neutral bus.

(h) Bond transformer XO to ground grid or ground rod.

E74.11 Handholes

(a) Ground/bond handholes in as follows:

(b) Install ground bus and grounding electrodes.

(c) Provide ground copper wire No. 6 AWG in concrete encasement and terminated on ground bus in each maintenance hole throughout duct bank system.

E74.12 Field Quality Control and Commissioning

(a) Conduct grounding system continuity and resistance tests using 62% or “fall of potential” method. Submit ground continuity and resistance test results to City of Winnipeg for review.

E74.13 Measurement and Payment

(a) Supplying and Installing Grounding Conductors shall be measured on a length basis and paid for at the Contract Unit Price per metre for “Supply and Install Grounding Conductors”, 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.

(b) Supplying and Installing CSTE Grounding Rods complete with grounding clamps, connectors, and tap connectors will be measured on a unit basis and paid for at the Contract Unit Price per unit 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.

E75. HANGERS AND SUPPORTS

DESCRIPTION

E75.1 General

(a) Labour, Products, equipment and services necessary for hangers and supports Work in accordance with the Contract Documents.

E75.2 References

(a) ANSI/MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

(b) ANSI/MSS SP-69, Pipe Hangers and Supports - Selection and Application.

(c) ANSI/UL-2196, Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables.

(d) ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron & Steel Products.

(e) ASTM A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

(f) ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

(g) ASTM A536, Standard Specification for Ductile Iron Castings.

(h) ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts.

(i) ASTM B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

(j) CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.

(k) NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems.

(l) CEC, Canadian Electrical Code.

(m) UL, Underwriters' Laboratories.

(n) cUL, Tested to Canadian Standards by Underwriters' Laboratories.

E75.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists.

(ii) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol.

(iii) Product transportation, storage, handling, and installation requirements.

E75.4 Manufacturers

(a) Unistrut Corporation.

(b) Hilti Corporation.

E75.5 Anchors

(a) Fastening devices in various types of structures to be sized by the Contractor for specific loading applications and installed in accordance with manufacturer's recommendations.

(b) Anchor bodies and expansion elements to be stainless steel in accordance with ASTM A240/A240M.

(c) Precast concrete panel:

(i) Medium to light-duty applications: Sleeve anchor, Grade 304 stainless steel, HLC by Hilti Corporation.

(ii) Heavy-duty applications: Heavy-duty expansion anchor, Grade 316 stainless steel, HSL-3 by Hilti Corporation.

(d) Concrete structure:

(i) Non-Seismic applications: Expansion anchor, stainless steel, KWIK Bolt 3 by Hilti Corporation.

(ii) Seismic application: Expansion anchor, stainless steel, KWIK Bolt-TZ by Hilti Corporation.

(iii) Concrete block wall:

(iv) Medium to light-duty applications: Sleeve anchor, Grade 304 stainless steel, HLC by Hilti Corporation.

(e) Concrete:

(i) Drop in anchor: Expansion type internally threaded and flush mounted; Grade 303 stainless steel (HDI) or carbon steel plated with a zinc finish (HDI-L), by Hilti Corporation.

E75.6 Steel Beam Clamps

(a) Ductile iron, electro-galvanized, BC-EG by Hilti Corporation, cUL listed, and in accordance with ASTM A536 and ANSI/MSS SP-58.

E75.7 Wire Harness

(a) Supply strapping for control wire and cable installation within equipment.

E75.8 Touch-Up Paint

(a) Inorganic zinc rich primer, in accordance with manufacturer's recommendations.

E75.9 Installation

(a) Install mounting channels for support of conduits, lighting fixtures, boxes, cabinets, and other electrical devices and equipment.

(b) Fasten mounting channels at maximum 100 mm from each end and install clamps for mounting conduits and cables on channels.

(c) Secure equipment to concrete structure with expansion anchors or drop-in anchors.

(d) Secure equipment to hollow masonry walls with sleeve anchors.

(e) Precast concrete panel: Obtain approval from City of Winnipeg before drilling precast concrete panels.

(f) Steel beams and columns: Obtain approval from City of Winnipeg before drilling through steel and bolt.

(g) Fasten exposed conduit or cables to structures or support system using straps, as follows:
  (i) One-hole steel straps to secure surface conduits and cables smaller than 50 mm dia.
  (ii) Two-hole steel straps for conduits and cables 50 mm and larger in diameter.
  (iii) Beam clamps to secure conduit to exposed steel work.

(h) Suspended support systems:
  (i) Support individual cable or conduit runs with minimum 6 mm dia threaded rods and spring clips.
  (ii) Support two or more cables or conduits on channels supported by minimum 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

(i) For surface mounting of two or more conduits, use channels at maximum 1500 mm o.c. spacing.

(j) Install metal brackets, frames, hangers, clamps, and other supports where indicated on Contract Drawings or as required to support conduit and cable runs.

(k) Install threaded rods and brackets for raceway risers where there is no wall support.

(l) Install beam clamps in accordance with ANSI/MSS SP-69.

(m) Do not use wire lashing or perforated straps to support or secure raceways or cables.

(n) Install fastenings and supports as required for each type of equipment, cables and conduits, and in accordance with manufacturer's recommendations.

(o) Touch up abrasions, cuts and welds of galvanized material with touch up paint and remove sharp edges.

E75.10 Measurement and Payment

(a) Supplying and Installing Hangers and Supports will be measured and paid for under E75, Conduits.

E76. JUNCTION AND SPLITTER BOXES

DESCRIPTION

E76.1 General

(a) Labour, Products, equipment and services necessary for splitter boxes, junction boxes, pull boxes and cabinets Work in accordance with the Contract Documents.

E76.2 References

(a) ANSI/ASA 61, Gray Powder Coating.

(b) CSA C22.2 No. 0, General Requirements – Canadian Electrical Code, Part II.

(c) CSA C22.2 No. 0.4, Bonding of Electrical Equipment.

(d) CSA C22.2 No. 26, Wireways, Auxiliary, Gutters and Associated Fittings.

(e) CSA C22.2 No. 40, Cutout, Junction and Pull Boxes.

(f) CSA C22.2 No. 85-M, Rigid PVC Boxes and Fittings.

(g) CSA C22.2 No. 94-M, Special Purpose Enclosures.

(h) NEMA, National Electrical Manufacturers Association.

(i) CEC, Canadian Electrical Code.

E76.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.

(ii) Performance criteria, compliance with appropriate reference standard, characteristics, limitations and troubleshooting protocol.

(iii) Product transportation, storage, handling and installation requirements.

(iv) Mounting details, methods and dimensions.

(v) Enclosure type and size.

(vi) Internal layout of identified components.

(vii) Front panel layout of identified components.

(viii) Electrical wiring diagram with internal and external connections.

(ix) Bill of material listing all components.

(x) Electrical schematic with description of operations, complete with terminal numbers and field connections.

E76.4 Manufacturers

(a) Hammond.

(b) Hubbell.

(c) Appleton.

(d) Eurobex.

(e) Thomas & Betts.

E76.5 Junction Boxes

(a) Rigid Galvanized Steel Threaded Conduit:

(i) Enclosures shall be fabricated from minimum 1.9 mm thick galvanized sheet steel, powder coated in accordance with ANSI/ASA 61, grey epoxy textured powder electrostatically applied inside and out and suitable for surface or flush mounting. Enclosure shall be complete with screw on cover, a neoprene gasket for a water-

tight seal and a 1.9 mm thick inner plate. Enclosures shall be minimum size of 150 mm x 150 mm x 100 mm. Type NEMA-3R.

(ii) (ii) Round junction boxes shall be fabricated from malleable iron, high tensile strength and ductility, high corrosion resistance and high impact and shock resistant. Junction boxes shall be suitable for exposed or concealed installations, cast ferrous alloy cover, neoprene gasket, 4 tapped holes, 2 external mounting tabs, 4 tapped conduit entries for rigid galvanized steel threaded conduit and 2 close-up plugs (hub size as required). Type NEMA-4 or stainless steel NEMA-4X, as indicated on Contract Drawings.

(b) Rigid PVC Conduit:

(i) Enclosures shall be fabricated of the same PVC material and provided by the same manufacturer as PVC conduit.

(c) Liquid-tight Flexible Conduit:

(i) Enclosures shall be fabricated from minimum 1.9 mm thick sheet steel, powder coated in accordance with ANSI/ASA 61, grey epoxy textured powder electrostatically applied inside and out and suitable for surface or flush mounting. Enclosure shall be complete with screw on cover, a neoprene gasket for a water-tight seal and a 1.9 mm thick inner plate. Enclosures shall be minimum size of 150 mm x 150 mm x 100 mm. Type NEMA-4 or stainless steel NEMA-4X, as indicated on Contract Drawings.

(ii) Round junction boxes shall be fabricated from malleable iron, high tensile strength and ductility, high corrosion resistance and high impact and shock resistant. Junction box shall be suitable for exposed or concealed installations, cast ferrous alloy cover, neoprene gasket, 4 tapped holes, 2 external mounting tabs, 4 tapped conduit entries for rigid galvanized steel threaded conduit and 2 close-up plugs (hub size as required). Type NEMA.

E76.6 Splitter Boxes

(a) CSA certified, unless indicated otherwise.

(b) Enclosures shall be fabricated from minimum 1.9 mm thick sheet steel, powder coated in accordance with ANSI/ASA 61, grey epoxy textured powder electrostatically applied inside and out and suitable for surface mounting. Enclosure shall have mounting holes, conduit knockouts, bracket hinges, padlocking provision, drip hood and interior panel. Splitter boxes shall be rated for minimum 600 volts, amperage as indicated on Contract Drawings and lugs to match. NEMA rating as indicated on Contract Drawings.

(c) Fire resistant backing: Fibre cement and galvanized sheet steel composite panel, 9.5 mm thick, 3DF2 by DuraSystem Barriers Inc.

E76.7 Installation

(a) Install junction and splitter boxes in locations indicated on Contract Drawings to suit Site conditions.

(b) Before proceeding with installation, ensure junction/splitter boxes, conduits and other electrical equipment clear mechanical, architectural and other installations.

(c) Install junction and splitter boxes in accordance with the CEC.

(d) Set boxes and fittings square with adjacent ceiling, floor, wall or beam line and support independently of conduits entering same. Keep unused knockouts flush and tight. Unused nailing or other holes in boxes not permitted.

(e) Locate boxes to be freely accessible. Locate boxes above suspended ceilings within reach of openings for fluorescent fixtures. Install access panels where boxes inaccessible.

(f) Conduit bends shall not exceed the equivalent of four 90° bends between pull boxes or maintenance holes in accordance with CEC.

(g) City of Winnipeg reserves right to alter location of any electrical installation by 1.5 metres, without increase to Contract Price, prior to outlet installation.

(h) Install correct identification for boxes.

E76.8 Measurement and Payment

(a) Supplying and Installing Junction Boxes complete with fastening and connectors will be measured on a unit basis and paid for at the Contract Unit Price per unit 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.

E77. CONDUITS

DESCRIPTION

E77.1 General

(a) Labour, Products, equipment and services necessary for conduits Work in accordance with the Contract Documents.

E77.2 References

(a) ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

(b) ASTM E136, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace 750°C.

(c) CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.

(d) CE12-1000, PVC Coated Rigid Metal Conduit.

(e) CEC 12-1200 thru 12-1220, Rigid RTRC (Fiberglass) Conduit.

(f) CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

(g) CSA C22.2 No. 45, Rigid Metal Conduit.

(h) CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

(i) CSA C22.2 No. 83, Electrical Metallic Tubing.

(j) CSA C22.2 No. 85, Rigid PVC Boxes and Fittings.

(k) NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems.

(l) CEC, Canadian Electrical Code.

E77.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.

(ii) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol.

(iii) Product transportation, storage, handling and installation requirements. Indicate application conditions and limitations of use of Product as stipulated by product testing agency specified under regulatory requirements.

(iv) All conduits used on Contract.

(v) All conduits terminations used on Contract.

(vi) All conduits supports used on Contract.

E77.4 Commissioning Submittal(s)

(a) Submit Test Procedures.

(b) Submit Certificate of Readiness.

(c) Submit Test Reports.

(d) Submit Closeout Report.

E77.5 Manufacturers

(a) PVC conduit: IPEX or Royal Pipe Systems.

(b) Metallic conduit: Columbia MBF/Allied Tubing or Wheatland Tube.

E77.6 Rigid Galvanized Steel (RGS) Conduit

(a) Material: Hot-dip galvanized steel tubing. Metallic rigid conduit other than hot-dip galvanized rigid steel is unacceptable.

(b) Applications: Indoor, outdoor, wet and dry locations, concealed or exposed to all atmospheric conditions.

(c) Fittings: Use threaded hubs (bullet hubs) for connections to threadless junction boxes, enclosures and equipment. Threaded hubs shall be of rugged steel/malleable iron construction, electro-zinc plated, complete with nylon insulated throat. Couplings shall be threaded of rugged steel/malleable iron construction and electro-zinc plated and shall allow conduit coupling without rotating either pipe. Straps shall be steel/malleable iron construction with hot-dipped galvanized finish. Expansion/contraction fitting shall be telescopic sleeve type with bonding jumper and made of steel/malleable iron construction with hot-dipped galvanized finish. Conduit bodies shall be steel/malleable iron with zinc electroplate finish.

(d) Conduit shall be threaded at both ends.

E77.7 Flexible Metal Conduit

(a) Material: Flexible steel armour.

(b) Restrictions: Not permitted in hazardous classified locations, embedded in concrete or aggregate, in wet locations, exposed to oil or gasoline. It shall not be subject to physical damage and limited to less than 1 m in public areas.

(c) Applications: Exposed or concealed work, limited to maximum 1 m unless noted otherwise and shall be approved by City of Winnipeg.

(d) Fittings: Rugged steel/malleable iron construction, electro-zinc plated, nylon insulated throat complete with bushing and locknut.

E77.8 Liquid-Tight Flexible Conduit

(a) Material: Corrosion resistant galvanized steel flexible inner core extruded with flexible durable PVC jacket. PVC jacket shall be resistant to sunlight, oils, acids and vapors while providing protection from moisture.

(b) Restrictions: Not permitted in hazardous classified locations, embedded in concrete, aggregate or cinder fill.

(c) Applications: Indoor, outdoor, concealed, wet and dry locations.

(d) Fittings: Compression metallic convolution type suitable for liquid-tight conduit where exposed to moisture, made from steel/malleable iron and electro-zinc plated and chromate coated for corrosion protection, complete with body, gland, locknut, ground cone, sealing gasket and insulator.

E77.9 Rigid PVC Conduit

(a) Material: Shall be Schedule-40, sunlight resistant, FT-4 rating, fire resistant, impact and chemical resistant, non-corrosive and non-magnetic.

(b) Restrictions: Not permitted in hazardous classified locations. It shall not be subject to physical damage.

(c) Applications: Underground, for use in direct burial, encased in concrete, embedded in concrete floors/ceilings slabs and in walls and in reinforced concrete ductbank. Above ground, encased or exposed.

(d) Fittings: Connectors, couplings, straps, elbows, expansion joint fittings, and conduit bodies shall be of the same material and manufacturer as PVC tubing. Expansion/contraction fitting shall be telescopic sleeve type with O-rings gasket.

(e) Cement shall be solvent type for PVC conduit by same manufacturer.

E77.10 Preparation

(a) Carefully clean conduits before and after installation. Clean burrs from ends and free inside surface from imperfections likely to damage wires or cables.

(b) Immediately before wires or cables pulled into any conduit run, snake with steel band with tube cleaner equipped with spherical mandrel, diameter minimum 85% of nominal inside diameter of conduit. Remove and replace conduits not passing mandrel.

E77.11 Installation – General

(a) Minimum conduit size 21 mm unless indicated otherwise. No reduction in sizes shall be permitted without the acceptance of City of Winnipeg.

(b) Prior to installation of conduit, check installation does not hinder or obstruct equipment or space allocated to other Products.

(c) Protect conduits from entrance of water or other foreign matter, by adequate and complete plugging overnight or when Work temporarily suspended. Plug ends of conduits with plastic plugs to ensure plugged or capped ends form watertight seal.

(d) Install surface mounted conduit parallel to, or at right angles to, structure lines, walls, ceilings or floors. Form bends, off-sets and supply necessary fittings for installation of conduits.

(e) Install conduits to allow conductors drawn-in without excessive strain or damage.

(f) Install fish wire in conduits to facilitate wire/cable pulling and additional fish wire left in place to facilitate pulling additional wires and cables.

(g) Exposed conduits shall be metallic and conduits embedded in concrete shall be non-metallic unless otherwise indicated.

(h) Use bends or off-sets only where necessary. Make bends and offsets in field with correct tools to avoid flattening of conduit. Split, deformed or damaged conduits not permitted.

(i) Install specified expansion or deflection fittings where conduits cross expansion/contraction or deflection joints.

(j) Install rigid hot-dipped galvanized steel conduits unless indicated otherwise. To be used for all electrical power circuits unless noted otherwise.

(k) Where rigid conduit enters pull boxes, junction boxes, panelboards and cabinets, install iron hub fittings.

(l) Fasten conduits with anchors spaced maximum 900 mm apart. Fasten clamps to concrete or masonry with specified anchors.

(m) Install hot-dipped galvanized steel supports necessary to mount conduit fittings, conduit and boxes in locations where no mounting surface available.

(n) Identify conduits at both ends.

(o) Install all conduits (metallic, non-metallic) to meet CEC and NFPA 130 requirements.

(p) Have Site inspected by City of Winnipeg after laying conduits but before backfill or concrete pouring.

(q) Flexible metal conduit shall not be used for connecting to panelboards.

(r) Conduits are to be concealed in areas accessible to public, unless indicated otherwise.

(s) Install separate ground conductor in all conduits sized to CEC unless noted otherwise.

E77.12 Installation - Metallic Conduits

(a) Fasten conduits by specified clamps spaced maximum 900 m apart. Fasten clamps to concrete or masonry with specified anchors.

(b) Apply Red Glyptal compound to threads of rigid galvanized metal conduit and fittings. Touch-up scratches and wrench marks with touch-up paint as work progresses.

(c) Install metallic conduit unless indicated otherwise.

(d) Installation of buried rigid, non-metallic conduit shall be at least 300 mm away from other services such as gas or water lines or as indicated/approved by City of Winnipeg.

E77.13 Installation - Non-Metallic Conduits

(a) Make joints in conduit with jointing cement approved for use with PVC conduits. Where non-metallic conduit passes through expansion joint, install expansion coupling.

(b) Where conduits are exposed, make transitions from non-metallic conduits to metallic conduits at minimum 150 mm below concrete surface.

(c) Direct buried and embedded in concrete conduits must be installed in parallel to or at right angles to the structure lines, walls, floors, ceilings from bends and offsets.

E77.14 Bending Radii

(a) Make bends in conduit of following minimum radii:

SIZE OF CONDUIT	MINIMUM BENDING RADIUS
21 mm & 27 mm	300 mm
41 mm	450 mm
53 mm	600 mm
103 mm	900 mm

E77.15 Measurement and Payment

(a) Conduit Hangers

(i) Supplying and Installing Bridge Hangers will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for “Supply and Install Bridge Hangers” 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 and accepted by the Contract Administrator.

(ii) The supply and installation of abutment hanger steel will be measured and paid for under Specification E29, Miscellaneous Metal.

(b) Conduits

(i) Supplying and Installing Conduits shall be measured on a length basis and paid for at the Contract Unit Price per metre for “Supply and Install Conduits”, 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.

(c) All excavation, backfill and concrete encasement will be considered incidental to the Work above.

E78. HORIZONTAL DIRECTIONAL DRILLING

DESCRIPTION

E78.1 General

(a) Labour, Products, equipment, and services necessary for the installation of new electrical power cable conduits by the horizontal directional drilling (HDD) method Work in accordance with the Contract Documents.

E78.2 Compliance Requirements

(a) Contractors are required to comply with applicable legislation, regulations, acts, codes, and policies, including, but not limited to the Manitoba Occupational Health and Safety, Worker's Compensation Board Standards, industry standards, and municipal requirements while completing horizontal directional drilling operations.

(b) In any case of conflict or discrepancy, the higher standard shall apply.

E78.3 Quality Assurance

(a) Experience: Actively engaged in horizontal directional drilling for minimum of 3 years.

(b) Field supervisory personnel: Experienced in the performance of the work and tasks as stated herein for minimum of 3 years.

E78.4 Submittals for information only:

(a) Presentation of similar experience in the last 3 years.

(b) Include, but not limited to, owner name, address, telephone number, contact person, date and duration of work, location, pipe information, and contents handled by pipeline.

(c) Supervisory field personnel and historical information of HDD experience. At least one field supervisors listed must be at site when HDD operations are in progress.

E78.5 Submit the following Shop Drawing(s):

(a) Working Drawings and written procedure describing in detail proposed method and entire operation for information only including, but not limited to:

(i) Size, capacity and arrangement of equipment.

(ii) Location and size of drilling and receiving pits.

(iii) Dewatering and methods of removing spoils material.

(iv) Method of installing detection wire and pipe.

(v) Type, location and method of installing locator station.

(vi) Method of fusion pipe segment and type of equipment.

(vii) Type of cutting head.

(viii) Method of monitoring and controlling line and grade.

(ix) Detection of surface movement.

E78.6 Project Conditions

(a) Complete HDD so as not to interfere with, interrupt, or endanger surface and activity thereon.

(b) Do not use HDD in rock stratum or subsoil consisting of boulders and underground obstructions that impede the process.

E78.7 Equipment

(a) The Contractor shall be responsible for the directional drilling method and equipment. The Contractor shall confirm that the drilling rig and mud mixing system have the capacity required to successfully complete the installation knowing the length of the crossing and product type and diameter, and shall consider ground and groundwater conditions that can be reasonably foreseen.

(b) Operating range and degree of accuracy of proposed tracking system shall be adequate to meet project conditions. Tracking/steering equipment shall allow for continuous monitoring of the drilling head along the entire proposed alignment. If a poor contact with the

transmitter is expected to occur at any section, this shall be communicated to the Engineer prior to commencement of construction.

(c) The drilling unit shall be equipped with an electrical strike safety package unless underground electrical utilities are confirmed not in the area. The package shall include warning sound alarm, grounding mats and protective gear.

(d) Only trained operators shall be permitted to operate the drilling equipment, and manufacture' operating instructions and safety practices shall always be followed.

E78.8 Pre-Commencement

(a) Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending Work. All utilities along and on either side of the proposed drill path are to be located prior to commencing the Work. Confirmation of notification shall be submitted to the Engineer prior to the initiation of any directional drilling operations.

(b) All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

(c) The proposed drill path shall be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.

(d) Excavations for entrance and exit pits are to be of sufficient size to avoid a sudden radius change of the pipe and resultant excessive deformation.

E78.9 Drilling Fluid

(a) Bentonite drilling mud compatible with the environment.

(b) Waste oil or environmentally non-compatible polymers cannot be part of composition.

E78.10 Detection Wire

(a) TW, THW, THWN, or HMWPE insulated copper.

(b) 10 gage or thicker wire.

E78.11 Drilling and Back-Reaming

(a) Contractor shall prevent drilling fluids from entering the manholes, sanitary and storm sewers, other drainage systems, and any waters including creeks and streams.

(b) A strict minimum bending radius guideline is imposed so as to avoid an excessively sharp bending radius and consequently, possible damages to the conduit. The entrance angle of the drill string shall be between 8 and 20 degrees to the horizontal, with 12 degrees considered optimal. The exit angle of the drill string shall be within the range of 5 to 10 degrees.

(c) Drilling mud shall be used during drilling and back-reaming operations. Drilling mud pressure in the borehole should not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil ("Frac-out").

(d) The pilot hole shall be back-reamed to accommodate and permit free sliding of the product inside the borehole. The Contractor shall be responsible for selecting the appropriate reamer size.

(e) A sufficient number of pre-reams shall be utilized as to avoid heaving while enlarging the hole to the desired diameter.

(f) Pipe rollers, skates or other protective devices should be used in the installation of conduits (6 in.) in outside diameter or larger.

(g) Pipe installation shall be performed in a manner that minimizes the over-stressing and straining of the pipe.

(h) During pull-back operations, the conduit shall be sealed with a cap or plug to prevent water, drilling fluids and other foreign materials from entering the pipe as it is being pulled back.

(i) Breakaway swivels shall be used with pulling head to limit the amount of force used during pull-back operation.

E78.12 Pipe Joining

(a) High Density Polyethylene

(i) Sections of pipe must be assembled and joined on the job site above ground. Joining must be accomplished by the butt-fusion method by qualified fusion technicians in strict conformance with the manufacturer's printed instructions. The joints must have a smooth, uniform, double rolled back bead made while supplying the proper melt, pressure and alignment. It is the sole responsibility of the Contractor to provide an acceptable butt-fusion joint. The Contractor must perform a leak test before pull back and all joints must be made available for inspection by the Engineer before insertion.

(b) PVC Pipe

(i) Sections of pipe must be assembled and joined on the job site above ground. Joining must be accomplished by the butt-fusion method in strict conformance with the manufacturer's printed instructions.

E78.13 Tie-Ins and Connections

(a) Trenching may be used to join sections at tie-ins of pipes installed by the directional boring method by:

(i) An additional pipe length, enough for joining to the next segment, must be pulled into the entrance pit. This length of the pipe must not be damaged or interfere with the subsequent drilling of the next leg. The Contractor must leave a minimum of 3 ft. of pipe above the ground on both sides of the bore hole, and

(ii) Polyethylene pipe, tie-ins and connections must only be made after a suitable time period to allow the pipe to recover. Recovery period must be equal to at least twice the pull-back time.

E78.14 Drilling Fluids Collection and Disposal Practices

(a) Excess drilling mud slurry must be contained in a lined pit or container pound at exit and entry points until recycled or removed from the site. Entrance and exit pits must be large enough to contain the expected return of drilling mud and spoils. Precautions must be taken to keep drilling fluids out of the streets, manholes, sanitary and storm sewers, and other drainage systems including streams and rivers. The Contractor must make all diligent efforts to minimize the amount of drilling fluids and cuttings spilled during the drilling operation and must provide complete clean-up of all drilling mud overflows or spills.

E78.15 Acceptance

(a) The Contractor must provide a set of as-built drawings including both alignment and profile from actual field readings. Raw data must be submitted upon Engineer's request. Pipe must be installed within the pre-specified alignment and grade tolerances as shown on the drawings or project specifications. All surfaces affected by the work must be restored to their pre-construction condition including backfilling, replacement of topsoil, seeding and fertilizer.

(b) The contractor must:

(i) Not obstruct driveways or streets unless approved by the Engineer. All lane closures must be in conformance with City of Winnipeg standards.

(ii) Drill pipe at a depth and grade shown on the drawings.

E78.16 Surface Tolerances

(a) The Contractor shall ensure that the possibility of ground settlement is reduced to a minimum underneath any roadway within or near the pipeline alignment. Surface

settlements shall not exceed 10mm over a 3.0m straight edge for the period from construction start to end of the Warranty Period.

(b) The contractor shall ensure that the possibility of ground bulging is reduced to a minimum underneath any roadway within or near the pipeline alignment. Surface bulging shall not exceed 10mm of a 3.0m straight edge for the period from construction start to end of the Warranty Period.

(c) Should settlement or bulging exceed the specified tolerance, the Contractor shall make the necessary surface grade correction. The method of correction shall be approved by the Engineer. All surface restoration costs shall be borne by the Contractor.

(d) If through the Warranty Period, settlements and bulging outside a roadway alignment within or near the pipeline alignments installed through the directional drilling method are identified, these areas shall be reviewed by the Engineer and a determination made with respect to the severity and remediation measures required. At a minimum nominal settlement and bulging outside of the pipeline alignments, within 50mm above or below the original ground surface, will be deemed acceptable permitted that positive surface drainage is maintained. Settlements or bulging in excess of this will be deemed a deficiency to the Contractor and will require immediate remediation, unless otherwise directed by the Engineer. All surface restoration costs shall be borne by the Contractor.

E78.17 Measurement and Payment

(a) Supplying and Installing Horizontal Directional Drilling shall be measured on a length basis and paid for at the Contract Unit Price per metre for “Supply and Install Horizontal Directional Drilling”, 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.

(b) All excavation, backfill and concrete encasement will be considered incidental to the Work above.

E79. DIRECT BURIED UNDERGROUND CONDUITS AND DUCTS

DESCRIPTION

E79.1 General

(a) Labour, Products, equipment and services necessary for direct buried underground conduits/ducts Work in accordance with the Contract Documents.

E79.2 References

(a) CSA C22.2 No. 85, Rigid PVC Boxes and Fittings.

(b) CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduits.

(c) CEC, Canadian Electrical Code.

E79.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.

(ii) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol.

(iii) Product transportation, storage, handling and installation requirements.

(iv) Location, depth and routing of conduits/ducts buried or encased in concrete.

(v) Provide conduit identification, circuit numbers, conduit routing length and conduit type.

(b) Closeout Submittal(s)

(i) Submit copy of full set of reviewed Shop Drawings and, if applicable, Marked-up Shop Drawings.

(ii) Submit warranty information.

E79.4 Rigid PVC Conduit/Duct

(a) Manufacturers

(i) Ipex Scepter.

(ii) Royal.

(b) Components

(i) PVC tubing shall be in accordance with CSA C22.2 No. 211.2, Schedule 40, sunlight resistant, FT-4 rating, fire resistant, impact and chemical resistant, non-corrosive and non-magnetic.

(ii) Used in direct burial, encased or in concrete reinforced duct bank.

(iii) PVC conduit fittings shall be of the same material and manufacturer as PVC conduit.

(iv) Cement shall be solvent type for PVC conduit of the same manufacturer as PVC conduit.

(v) Rigid type EB1 and DB2/ES2 (CSA C22.2 No. 211.1) PVC conduit is not permitted.

E79.5 Fish Wire

(a) Yellow, waterproof, polypropylene rope, minimum 6 mm diameter.

E79.6 Warning Tape

(a) 0.10 mm thick polyethylene tape manufactured by Brady or Seton.

E79.7 Trenching and Backfilling

(a) Trenching shall be approximately 1000mm in depth, width to suit proper installation.

(b) Backfill for trenches for all direct buried cables, ducts, conduits, etc., shall consist of fine sand (minimum 100 mm below and above cables, etc.) and firmly compacted. Backfill finishing material shall be as indicated in Division 03.

(c) All direct buried cables, ducts, etc., crossing over each other or over/under other types of underground service shall be encased in wood planks treated with pentachlorophenol.

(d) Frozen earth, large lumps or boulders shall not be used for backfill material.

(e) Provide treated wood planks meeting approved wood treatment materials over all buried cables, etc., under existing or future roads and sidewalks.

(f) Provide sleeves under all parking, concrete and traffic areas for cables.

(g) Where cables enter building provide a vertical 100 X 250 mm white sign with black wording ELECTRICAL CABLES securely fastened to the building wall approximately 300 mm above finished grade.

E79.8 Installation - General

(a) Provide identification tape labelled as indicated showing location of direct buried cables

(b) After specified sand bed is in place, lay cables in trench, maintaining a 75 mm minimum clearance from each side of trench to nearest cable. Do not pull cable into trench.

(c) Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 M run, maintaining mir1Imum cable separation and bending radius requirements.

(d) Underground cable splices not acceptable.

(e) Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

(f) Maintain 75 mm minimum separation between cables of different circuits. Maintain 300 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables. Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables with fire alarm and control cables in upper position. Install treated planks on lower cables 0.6 m in each direction at crossings.

(g) After sand protective, cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

E79.9 Installation – Direct Buried Conduits/Ducts

(a) Install rigid PVC conduits/ducts in accordance with manufacturer's instructions, in locations indicated on Contract Drawings and in accordance with the CEC.

(b) Use manufactured curved segments for sweep bends. For large radius bends use equal straight segments joined together with deflection couplings to give maximum deflection at each coupling of 5 degree.

(c) Buried conduits/ducts shall run parallel to or 90 degree to building lines.

(d) At joints, apply jointing cement in accordance with manufacturer's instructions.

(e) Prior to backfill, notify City of Winnipeg to verify location, depth and routing of conduits/ducts.

(f) Install fish wire in empty conduits/ducts to facilitate wire and cable pulling.

(g) Immediately before pulling wires or cables into conduit run, snake conduits with steel band attached to tube cleaner equipped with spherical mandrel of diameter minimum 85% of nominal inside diameter of conduit. Remove and replace conduits not passing mandrel.

(h) Clean conduits/ducts ends of burrs. Thoroughly clean with suitable mandrels to remove dirt, concrete and imperfections likely to damage wires or cables during pulling operation.

(i) Remove or replace conduits/ducts not permitting free passage of wires and cables.

(j) Protect conduits/ducts from entrance of water or other foreign matter by capping overnight, or if Work is temporarily suspended. Cap unused conduits/ducts for watertight seal.

(k) Place red plastic warning tape above centreline of each conduit/duct, 300 mm below grade, through entire length of run unless indicated otherwise.

(l) Close both ends of spare ducts and future ducts with bell end plug of same material duct, inserted into a coupling to form a watertight seal.

(m) Backfill conduits/ducts.

E79.10 Bending Radii

(a) Make bends in conduit of following minimum radii:

SIZE OF CONDUIT	MINIMUM BENDING RADIUS
21 mm & 27 mm	300 mm
41 mm	450 mm
53 mm	600 mm
103 mm	900 mm

E79.11 Testing of Direct Buried Cables

(a) Perform tests using qualified personnel. Provide necessary instruments and equipment.

(b) Check phase rotation and identify each phase conductor of each feeder.

(c) Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

(d) Pre-acceptance tests.

(i) After installing cable but before terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

(ii) Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

(e) Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.

(f) Remove and replace entire length of cable if cable fails to meet any of test criteria.

(g) Contractor responsible for making all necessary repairs to installation resulting from improper backfilling, compaction, etc.

MEASUREMENT AND PAYMENT

E79.12 General

(a) Direct Buried Underground Conduits and Ducts will be measured on a length basis and paid for at the Contract Unit Price per unit for the “Items of Work” listed 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.

E79.13 Items of Work:

(a) Buried Underground Conduits

(i) Trenching and Backfilling

(ii) Buried 53mm PVC Conduit

E80. ELECTRICAL IDENTIFICATION

DESCRIPTION

E80.1 General

(a) Labour, Products, equipment, and services necessary for identification of electrical equipment and systems in accordance with Contract Documents.

E80.2 References

(a) CEC, Canadian Electrical Code.

E80.3 Identification Requirements

(a) Use identification system on Shop Drawings.

(b) Identification to be in English.

(c) Develop principal equipment numbers as specified in this Section.

(d) Manufacturer’s Nameplate:

(i) Mount manufacturer's nameplate with raised letters on each piece of equipment, mechanically fastened using stainless steel rivets or screws.

(ii) Indicate:

i. Size.

ii. Model.

iii. Manufacturer's name.

iv. Serial number.

v. Performance data.

vi. Electrical data: Including voltage, cycle, phase, power, and motor size.
vii. Service information.
viii. Manufacturing date.

(e) Install approval label and registration plates (i.e., CSA or ULC) as required by authorities having jurisdiction.

E80.4 Submittals

(a) Submit the following Shop Drawing(s):
(i) Catalogue cut sheets, technical data, and standard details.
(ii) Manufacturer's installation requirements and instructions.
(iii) Equipment schedule indicating equipment location (including room number), service, identifier, nameplate type, and nameplate colour.
(iv) Fasteners, colour of background, dimensions, thicknesses, finishes, and colour of identification letters per application.
(v) Composite identification label and fastener detail.
(vi) Nameplate drawings complete with associated wording.

E80.5 Nameplates

(a) Fabricate nameplates to withstand wear or deterioration of lettering in located environment.
(b) Equipment and component nameplates: Black letters on white background.
(c) Manufacturer(s):
(i) Brady Canada.
(ii) Seton Canada.

E80.6 Conduit and Cable Tags

(a) Circular, stainless steel tags. Size to suit electrical identifier, with identification markings machine engraved uppercase, 6 mm high, black lettering. Tags to be complete with stainless steel wire, clamps, and associated fasteners.
(b) Manufacturer(s):
(i) Brady Canada.
(ii) Seton Canada.

E80.7 Wire Markers

(a) White, slip-on polyolefin printable markers with black imprint.
(b) Manufacturer(s):
(i) Brady Canada.
(ii) Thomas & Betts.

E80.8 Buried Conduit and Cable Markers

(a) 0.10 mm thick polyethylene electrical warning tape.
(b) Manufacturer(s)
(i) Brady Canada.
(ii) Seton Canada.

E80.9 Permanent Electrical Colour Coding Tape

(a) 0.18 mm thick vinyl plastic tape.
(b) Product(s) and Manufacturer(s)
(i) Scotch 35 Series, by 3M Inc.

E80.10 Installation

(a) Install identification in accordance with manufacturer's written instructions.

(b) Conduit and cable

(i) Colour code conduit, cable, and metallic sheathed cable with permanent plastic tape or paint strip, in accordance with manufacturer’s recommendation, at points where conduit or cable enters walls, ceilings or floors, and at 15 m intervals.

(ii) Identify embedded conduit and cable with tags securely affixed to surface of concrete adjacent to box, device or equipment from which it originates. Secure conduit and cable tags to substrate with minimum of two stainless steel fasteners.

(iii) Tags for embedded conduit and cable within tunnel and box structure safety walkways to be located on vertical concrete face of safety walkway.

(iv) Arrange numbering on conduit and cable tags to prevent numbers being obscured by adjacent conduits and cables.

(v) Identify conduit and cable within 150 mm of box, device or equipment from which it originates and from which it ends.

(vi) Identify conduit and cable penetrating walls, floor or ceilings on both sides.

(vii) Identify conduit and cable where they exit or enter from or to other raceway systems.

(c) Wire

(i) Identify power wiring with wire markers on both ends of phase conductors of feeders and branch circuit wiring in accordance with CEC.

(ii) Identify control wiring with wire markers. Number in accordance with wiring interconnection lists, schematic diagrams, and schedules where applicable.

(d) Identify individual wires with wire markers applied at both ends of wire.

(e) Circuiting designation to include panel designation, circuit number, and wiring at devices, including terminal blocks and junction points.

(f) Provide wire identification system consistent with schematics.

(g) Place identification labels within 10 mm of terminating point in visible location.

(h) Maintain phase sequence and colour coding throughout Work.

(i) For buried incoming services install buried-conduit and buried-cable markers on building where buried service enters.

(j) Equipment

(i) Place identifying label on each cell or cubicle of electrical equipment, comprised of several cells or cubicles such as switchgear and motor control centres.

(ii) Visible manufacturer's trademarks, nameplates or names are not permitted in areas accessible to the public.

(iii) Provide high voltage equipment with warning signs, suitably engraved as required to meet requirements of inspection authority.

(iv) Identify junction boxes enclosing wires or connections with equipment nameplates including voltage, circuit number, and source.

(v) Provide equipment nameplates on equipment such as circuit breakers, disconnect switches, panelboards, and pushbutton stations.

(vi) Mount typewritten circuit directory with clear plastic cover on inside of each panelboard door, and indicate breaker or switch circuit number, rating, load description and load data, and panel number.

(k) Nameplates

(i) Secure nameplates to equipment and substrates with minimum of two self-tapping stainless steel screws. Do not allow screws to extend more than 3 mm beyond enclosure interior wall and remove sharp ends. Adhesive type labelling is not permitted.

(ii) Wording on nameplates: To be acceptable to City of Winnipeg prior to manufacturing.

(iii) Ensure manufacturer's nameplates and authority approval (CSA, ULC) labels are visible and legible after equipment is installed.

(iv) Clean surface with alcohol before applying waterproof polyester labels.

E81. ELECTRICAL TESTING

DESCRIPTION

E81.1 General

(a) Labour, Products, equipment and services necessary electrical testing Work in accordance with the Contract Documents.

(b) Test conduits and ducts installed but required left empty for clean bore. Install fish wire and cap.

(c) Testing methods and test results to CSA, the Electrical Code, Manitoba Hydro, authorities having jurisdiction and manufacturer's recommendations.

(d) Perform testing with systems completely connected, both loaded and unloaded.

E81.2 References

(a) ANSI/NEMA-ST-20, Dry Type Transformers for General Applications.

(b) CAN/CSA C22.2 No. 29-M, Panelboards and Enclosed Panelboards.

(c) CSA C9, Dry Type Transformers.

(d) CEC, Canadian Electrical Code.

E81.3 Electrical Distribution System

(a) Control and switching:

(i) Test circuits for correct operation of devices, switches and controls.

(b) Polarity tests:

(i) Test circuits for correct operation of devices and polarity sequence.

(c) Voltage tests:

(i) Perform voltage test at last outlet of each circuit. Maximum drop in potential permitted 3% on 120 V and 208 V branch circuits: 3% on 208 V feeder circuits; and 3% on 600 V feeder circuits.

(d) Phase balance:

(i) Measure load on each phase at each switchboard, splitter, distribution panelboard and report results in writing to City of Winnipeg. Re-arrange phase connections as necessary to balance load on each phase as instructed by City of Winnipeg. Re-arrangement restricted to exchanging of connections at distribution points.

(e) Supply voltage:

(i) Measure line voltage of each phase at load terminals of main breakers and report results in writing to City of Winnipeg. Perform supply voltage test to electrical equipment in use.

(f) Conductors:

(i) Dielectric test on 120/208 V equipment and wiring: Apply 500 V DC for one minute between phase conductors and between each phase conductor and ground. Test voltages for 600 V equipment and cables as recommended by manufacturers of equipment and cable.

(ii) Insulation resistance test: After dielectric test complete, measure insulation resistance by approved resistance measuring instrument. Insulation resistance

between connected system and ground: minimum values prescribed under Insulation Resistance in the CEC.

(iii) Remove and replace shorted, grounded or defective conductors.

(g) Distribution panels:

(i) Verify and record information for each distribution panel as to:

i. Manufacturer.
ii. Amp Rating.
iii. Voltage.
iv. Phasing.
v. Correct operation of each breaker.
vi. Labelling.

(h) Grounding

(i) Verify resistance and continuity of driven electrodes, connections, grounding conductors, main bonding conductors and supplementary bonding conductors.

(i) Ducts/Conduits

(i) Verify each underground duct or conduit to contain no blockages by pulling through appropriately sized mandrel in presence of City of Winnipeg.

E82. PANELBOARDS

DESCRIPTION

E82.1 General

(a) Labour, Products, equipment and services necessary for panelboard Work in accordance with the Contract Documents.

E82.2 References

(a) ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by Hot-Dip Process.

(b) CSA C22.2 No. 29, Panelboards and Enclosed Panelboards.

(c) CAN/CGSB-1.81-M, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.

(d) CAN/CGSB-1.104-M, Semigloss Alkyd Air Drying and Baking Enamel.

(e) CSA C22.2 No. 0.4, Bonding of Electrical Equipment.

(f) CSA C22.2 No. 5, Moulded Case Circuit Breakers, Molded – Case Switches and Circuit-Breaker Enclosures.

(g) CSA C 22.2 No. 94-M, Special Purpose Enclosures.

(h) CEC, Canadian Electrical Code.

E82.3 Submittals

(a) Submit the following Shop Drawing(s):

(i) Technical data, supplemented by bulletins, component illustration, detailed views, technical descriptions of items, and parts lists.

(ii) Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol.

(iii) Product transportation, storage, handling, and installation requirements.

(iv) Elevations, sections and details of components, dimensions, gauges, finishes and relationship to adjacent construction.

(v) Schematic, complete panel circuit schedule in accordance with Contract Documents.

(b) Commissioning Submittal(s)
  (i) Submit Test Procedures.
  (ii) Submit Certificate of Readiness.
  (iii) Submit Test Reports.
  (iv) Submit Closeout Report.

(c) Manufacturers
  (i) Schneider Electric.
  (ii) Cutler-Hammer.

E82.4 Materials

(a) Steel sheet: ASTM A653, Z275 coating designation; galvanized steel sheet.

(b) Stainless steel sheet: ASTM A240, type 304.

(c) Expanding type metallic anchors: Cinch two unit threaded anchorages.

(d) Bolts: 10 mm diameter to suit anchors.

E82.5 Panelboard

(a) Panelboards: To CSA C22.2 No. 29 and Canadian Electrical Code requirements, including barriers.

(b) Electrical Ratings
  (i) Panel voltage, amperage, number of circuits, branch breakers, etc., as indicated in Panelboard schedules as shown on Contract Documents and unless noted otherwise.

(c) Panelboard interiors factory assembled, with bolt-on circuit breakers and designed so circuit breakers for replacement without disturbing adjacent devices and without removing main bus connectors.

(d) Panelboards with tin plated copper buses, bus bracing 22 kA unless noted otherwise.

(e) Main bus bars shall be rated for continuous current as indicated on the Contract Documents. Bussing shall be of sufficient cross- sectional area to meet CSA C22-2 No. 29 standard for temperature rise.

(f) Solid neutral bus shall be designed to meet the requirements of CSA C22.2 Nos. 0.4 and

(g) Neutral bussing shall have a suitable lug for each outgoing feeder and spaces on the panel board.

(h) Solidly bonded copper ground bus shall be provided.

(i) All circuit carrying parts shall be insulated from ground and phase-to–phase by high dielectric strength barrier or equivalent.

(j) Main circuit breaker and main lug panel board interior shall be field convertible for top or bottom incoming feed.

(k) Built-in surge protection device sized in accordance with specific panelboard electrical characteristics.

(l) All unused space provided, unless otherwise specified, shall be fully equipped for future devises, including all appropriate connectors and mounting hardware.

(m) Interior trim shall be dead-front construction to shield user from energized parts. Empty spaces shall be provided with blanking plates.

(n) Connections with solderless lugs on main and neutral busbars and at circuit breaker load terminals.

(o) Cabinets of steel sheet, thickness equal to code gauge for similar steel cabinets, fabricated in C form type style and having spot-welded seams.

E82.6 Circuit Breakers (Main and Branch)

(a) All circuit breakers: Moulded case, over-centre, trip-free, toggle mechanism, operated with quick-make, quick-break contact action, calibrated at 40°C, bolted into panel assemblies of busses and connectors. Trip ratings as shown on the Contract Documents.

(b) Circuit breakers: one, two or three pole as required, equipped with thermal and magnetic trip units having inverse time current characteristics. Two-pole and three-pole breakers shall have common trip action between individual trip elements for each pole. Automatic tripping indicated by breaker handle assuming distinctive position from manual "on" and "off" positions.

(c) Circuit breakers (main and branch) frame size as shown on Contract Documents meeting requirements of CSA C22.2 No. 5M with minimum 22 kAIC unless noted otherwise.

(d) Circuit breakers handle and faceplate shall indicate rated ampacity. Standard construction of circuit breakers shall comply for reverse connection without restrictive line or load markings.

(e) Branch circuit breaker shall be CSA or cUL listed as HACR (Suitable for Heating, Air-conditioning Loads) or SWD (Switch duty of fluorescent or High Intensity Discharge Lighting Load).

(f) Provide ground fault circuit breaker with 30 mA sensitivity as shown on Contract Documents. Ground fault circuit–breaker with minimum 10 kAIC at 208 V or 600 V.

E82.7 Enclosures

(a) Constructed from galvanized steel sheet, of thickness equal to code gauge for similar steel cabinets, fabricated by "forming up" and having spot-welded seams. Panelboard cabinet assembly to comply with CSA enclosure type 2.

(b) Enclosure width shall be maximum 660 mm, minimum 508 mm.

(c) Enclosures shall have end walls with knockouts complete with welded interior mounting studs.

(d) Finish on enclosures and trim as follows:

(i) High quality metal primer coat to CAN/CGSB-1.81-M, Type 1 and filler and Body coats then applied on inside and outside surfaces.

(ii) Finish coats alkyd base enamel conforming to CAN/CGSB-1.104-M colour conforming to CGSB 1-GP-12c, Section 5, Code 501-211, Grey Semi-gloss, type 11. Each enamel coat dried and rubbed before following coat applied.

(iii) Cardholder for circuit designation cards, consisting of heavy white paper under transparent cover and mounted in suitable metal frame, supplied on back of each panel door.

(e) Trim

(i) Galvanized steel sheet, of code thickness.

(ii) Trim shall be one piece with hinged door and mounted with trim screws door-in-door. Mounting shall be flush or surface as indicated on the Contract Documents.

(iii) Front cover plate complete with lock shall be hinged to door.

(iv) Each door with latch and flush cylinder type lock operated with key. Supply two keys for each lock. Fasten trim to cabinets by means of approved non-corroding clamps.

(f) Panel Circuit Schedule

(i) After panelboards are phase balanced, fill-in panel circuit schedule and insert it into cardholder provided on back of panel door. Schedule shall be typewritten and neatly arranged indicating which loads fed by each circuit.

E82.8 Installation

(a) Install panelboards in outdoor, padmounted CSTE’s (Customer Service Termination Enclosures as indicated on the Contract Documents.

E82.9 Measurement and Payment

(a) Supplying and Installing panelboards will be measured and paid for under Specification E83, Customer Service Termination Enclosures.

E83. CUSTOMER SERVICE TERMINATION ENCLOSURES

DESCRIPTION

E83.1 Labour, Products, equipment and services necessary for three (3) Customer Service Termination Enclosures (CSTEs) Work associated with the power supplies for all the under bridge and pathway lighting fixtures as follows:

(a) CSTE “A” – Reenders Dr. to Almey Ave. Pathway Lighting;

(b) CSTE “B” – El Tassi Dr. to Peguis St. Pathway Lighting;

(c) CSTE “C” – Under Bridge Wall Pack Lighting & Concordia Ave. Pathway Lighting.

E83.2 Enclosure

(a) Free-standing, pad mounted totally enclosed 12 GA mild steel constructions, weather proof NEMA type 3R enclosure with steel frame, suitable for outdoor installation.

(b) Outer doors c/w neoprene gasketing;

(c) Enclosure exterior & interior finish:

(d) ASA 61 textured grey.

(e) Top interior shall be sprayed overall with anti-condensation mastic;

(f) High conductivity tin plated aluminum bus;

(g) Ground lug pan;

(h) Studs for 2 hole NEMA compression lugs provided on line side;

(i) Cu/Al mechanical lug provided on load side;

(j) Tamper proof hinges.

(k) Pad lockable handle c/w 3-point latch, rods & guides.

(l) Sheet steel barriers to separate adjoining sections.

(m) Hinged access panels with seal screws. Utility metering section to have provision for utility seals.

(n) Enclosure to be in accordance with Manitoba Hydro – Customer Metering Standards 3rd Edition, August 1, 2015 and marked as per section 2-100 of The Manitoba Electrical Code, 13th Edition.

E83.3 Power Supply

(a) As indicated on the Contract Documents.

(b) 60 Hz.

(c) Grounded neutral.

(d) 22kA RMS symmetrical.

E83.4 Main Breaker

(a) 100A, 120/240V, 1ϕ, 3W.

(b) Service entrance rated;

(c) LSIG;

(d) Rating and configuration as indicated on the Contract Documents.

(e) 22 kAIC.

E83.5 Utility Metering Section:

(a) Separate compartment exterior mounted on side of enclosure for exclusive use of Manitoba Hydro utility metering transformers;

(b) Utility metering socket:
  (i) 100A, 120/240V, 1ϕ, 3W rated;
  (ii) 4 – jaw;
  (iii) Underground c/w ½" compression studs;
  (iv) Acceptable manufacturer Hydel Model MSC.

(c) Provide mounting and wiring for the potential (PT) and current (CT) metering transformers to be supplied by the Hydro utility and factory installed by the CSTE manufacturer.

E83.6 Panelboards

(a) Panelboards mounted inside CSTE enclosures as specified in Specification E82, Panelboards and specified herein:
  (i) 100A, Cu mains;
  (ii) 120/240V, 1ϕ, 3W;
  (iii) 18 spaces;
  (iv) Built-in surge protection;
  (v) Breaker ratings and configurations as indicated in Panelboard schedules on the Contract Documents.
  (vi) 18 kA RMS symmetrical.
  (vii) Acceptable manufacturer: Schneider Electric / Square D Model NQ or approved equal.

E83.7 Lighting Control Section

(a) Control section located in CSTE enclosure interior as specified herein:

(b) Panel mounted selector switches:
  (i) 3 – position "HAND/OFF/AUTO";
  (ii) 22mm, oil-tight;
  (iii) Acceptable manufacturer: Schneider Electric ZB series.

(c) Panel mounted pilot lights:
  (i) Green LED;
  (ii) 22mm, oil-tight;
  (iii) Acceptable manufacturer: Schneider Electric ZB series.

(d) Lighting power contactors:
  (i) Type L, multipole;
  (ii) 30A, 240V rated contacts;
  (iii) 120V, 60Hz coil;
  (iv) Electrically held,
  (v) Open style;
  (vi) Acceptable manufacturer: Schneider Electric 8903 series.

(e) Photocell:
  (i) Stem mounted, thermal-type;
  (ii) Cadmium sulfide photocell;
  (iii) Sonic welded polycarbonate housing and lens;
  (iv) Heavy duty die cast housing;
  (v) 15A, 120V;

(vi) Operating temp: -40oC to 70oC;

(vii) Acceptable manufacturer: Intermatic Model K4421M or approved equal.

(f) Lamacoid identification for all devices as indicated.

(g) Miscellaneous fuses, breakers, ground terminals, lugs, etc., as required.

E83.8 Fibreglass Pad

(a) Custom fabricated fibreglass pad (sized to suit);

(b) Exterior finish: Gelcoated “Seafoam Green”;

(c) Acceptable manufacturer shall be Structural Composite Technologies or approved equal.

E83.9 CSTE Manufacturer

(a) Strong Electric or approved equal.

E83.10 Measurement and Payment

(a) Supplying and Installing CSTE’s complete with utility service connection, fibreglass pad and all connectors will be measured on a unit basis and paid for at the Contract Unit Price per unit 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.

E84. LIGHTING EQUIPMENT

DESCRIPTION

E84.1 General

(a) Labour, Products, equipment, and services necessary for lighting equipment Work in accordance with the Contract Documents.

E84.2 References

(a) CSA C22.2 No. 9.0, General Requirements for Luminaries.

(b) CSA C22.2 No. 250.0, Luminaires.

(c) CAN/CSA-C22.2 No. 250.13, Light Emitting Diode (LED) Equipment for Lighting Applications.

(d) NEMA SSL-1, Electronic Drivers for LED Devices, Arrays, or Systems.

(e) CEC, Canadian Electrical Code.

(f) UL 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products.

E84.3 Submittals

(a) Submit the following Shop Drawing(s):

(b) Technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists.

(c) Luminaire photometric data: Computer generated illuminance print out for area lit by luminaire.

(d) Elevations, sections, and details of fixtures and components, dimensions, gauges, finishes, and relationship to adjacent construction.

(e) Manufacturer’s technical documentation for lamps such as operating voltages, wattage, lumens, rated life, colour temperature K, base type, and lamp shape.

E84.4 Commissioning Submittal(s)

(a) Submit Test Procedures.

(b) Submit Certificate of Readiness.

(c) Submit Test Reports.

(d) Submit Closeout Report.

E84.5 Green Lighting Design

(a) Use energy-efficient lamps.

E84.6 Extended Warranty

(a) Provide warranty for full replacement parts and labour included from the date of Substantial Performance, except warranty period is extended to 5 years.

E84.7 Luminaires

(a) Provide luminaries as noted in lighting fixture schedules shown on the Contract Drawings.

(b) LED module/diode manufacturer(s)

(i) Cree, Inc.

(ii) Philips Lighting Holding B.V.

(iii) Osram-Sylvania Ltd.

(iv) Nichia Corporation.

(c) LED Lamps/Driver

(i) Colour temperature of 4000 K +/-250, unless otherwise specified.

(ii) Minimum CRI of 65.

(iii) Form factor: Round or square in accordance with the application.

(iv) Efficacy: Minimum 90 lm/W.

(v) L70 of ≥ 100,000 hours (70% of initial lumens) at 25°C outdoor and 55°C for indoor, and supported by IES LM-80 and IES TM-21 calculations.

(vi) With fixture-integrated passive heat sinking.

(vii) IES file based on IES LM-79.

(viii) Provide IP rating and, where applicable, for hazardous locations.

(ix) Photo cell compatible with LED Driver.

(x) LED fixtures to be in service 24/7.

(xi) Colour temperature shift of L70 rating.

E84.8 Fixture Type “B” – Under Bridge Lighting

E84.8.1 Underpass surface-mounted roadway luminaire suitable for outdoor installation:

(a) Type: LED;

(b) Wattage: 51W;

(c) Voltage: Auto-sensing 120-277V;

(d) Lumens: 6337;

(e) CRI: 70;

(f) Temperature: 4000K;

(g) Surge protection:

(i) Built-in;

(ii) 20kV / 10kA;

(iii) Fail-off style.

(h) Housing:

(i) Sealed and gasketted, IP66 rated;

(ii) Diecast aluminum alloy;
(iii) Latched door.

(i) Finish:
(i) Zinc-infused TGIC thermoset powder coat finish;
(ii) Black Super Durable paint;

(j) Optics:
(i) Borosilicate glass refractor lens;
(ii) Type IV underpass distribution;

(k) Acceptable Manufacturer:
(i) Holophane WallConnect Model No. WCNG P3 40K U4W 120 20KV BKSDP SCRW.

E84.9 Fixture Type “C1” - Pathway Lighting

E84.9.1 Decorative acorn-shaped utility pole-mounted luminaire suitable for outdoor installation:

(a) Type: LED;
(b) Wattage: 61W;
(c) Voltage: Auto-sensing 120-277V;
(d) Lumens: 7003;
(e) CRI: 70;
(f) Temperature: 4000K;
(g) Housing:
(i) Modern style swing open design;
(ii) Heavy grade A360 cast aluminum;
(iii) IP55 rated tool-less access with a spring-loaded latch
(h) Finish: Black polyester power coat paint.
(i) Optics:
(i) IES Type III distribution;
(ii) IP66 rated molded thermal resistant acrylic refractor;
(iii) Lunar optic shielding.
(j) Accessories:
(i) Shorting cap;
(ii) 20’ prewired leads.
(k) Acceptable Manufacturer:
(i) Holophane Acrylic Washington Postlite Utility Model No. AWDE3 P30 40K MVOLT MS AL3LU SH L20.

E84.9.2 One piece tapered aluminum pole:

(a) Material:
(i) 6063-T4 aluminum tube;
(ii) Heat treated to T6 condition after welding.
(b) Finish: Powder paint black DBL.
(c) Height: 4.78m (15’ 8”);
(d) Diameter:
(i) Bottom: 178mm (7”);
(ii) Top: 102mm (4”).

(e) Wall thickness: 4mm (0.156”).

(f) Tenon: 76mm (3”) OD aluminum.

(g) Handhole:

(i) 100mm (4”) X 200mm (8”) reinforced aluminum opening;

(ii) 8mm (5/16”) – 18 threaded ground connector hole;

(iii) Flush fitting aluminum door.

(h) Cast aluminum anchor base.

(i) Acceptable Manufacturer:

(i) Valmont

E84.9.3 Pathway Lighting Poles Concrete Pile Foundations:

(a) Dimensions:

(i) Shape: Hexagonal;

(ii) Length: 1900mm;

(iii) Width:400mm;

(b) Precast concrete base:

(i) Conforms to C.S.A. Specification CAN3—A23.1 AND CAN3—A23.4;

(ii) Cement shall be Type 50, sulphate resistant conforming to C.S.A. Specification CAN/CSA— A5/A8/A362;

(iii) Minimum Specified Compressive Strength shall be 35 MPa at 28 days;

(iv) Max. Water/Cement Ratio shall be 0.45, with entrained air of 5 to 8%;

(v) Minimum concrete cover on all reinforcing steel shall be 50mm;

(vi) 25mm chamfer on all exposed concrete edges;

(vii) Each base shall have the number 179 indented (or otherwise permanently marked) on the top of the base.

(c) Poly pipe:

(i) Series 75;

(ii) 63mm diameter;

(iii) Each base shall be equipped with a prominent vee groove located in the chamfer of the base to indicate the location of the poly pipe.

(d) Anchor bolts:

(i) Four (4) required;

(ii) Diameter: 25mm;

(iii) Length: 1750mm;

(iv) Grade 300W as per CSA G40.21M;

(v) Threaded 100mm at both ends;

(vi) One end of each anchor bolt shall be galvanized for a minimum length of 150mm and shall be supplied c/w two 25mm hex nuts and a flat round washer. One nut shall be threaded onto the embedded end of each anchor bolt.

(vii) Anchor bolt circle diameter: 254mm.

(viii) All material including nuts and washers to be hot dipped galvanized in accordance with CSA G164-M.

(e) Ties:

(i) Diameter: 6mm;

(ii) Spacing: 300mm.

(f) Lifting loops:

(i) Two (2) required;

(ii) 3 strand X 4.0mm grade 130 (min. breaking strength = 25kN) galvanized steel wire.
(iii) Loops shall be centred on concrete pile balance point;
(iv) Upper loop attached a maximum of 450mm from the top of the base;
(v) Loops internal clearance: 75mm (min);
(vi) Wire ends shall be embedded 300mm (min).

(g) Acceptable Standard:
(i) MB Hydro Standard Precast Concrete Base For 7.7m Metal Street Light Poles No. CK 15-6 M.

E84.10 Fixture Type “C2” - Pathway Lighting

E84.10.1 Decorative acorn-shaped utility pole-mounted luminaire suitable for outdoor installation:

(a) Type: LED;
(b) Wattage: 61W;
(c) Voltage: Auto-sensing 120-277V;
(d) Lumens: 7003;
(e) CRI: 70;
(f) Temperature: 4000K;
(g) Housing:
(i) Modern style swing open design;
(ii) Heavy grade A360 cast aluminum;
(iii) IP55 rated tool-less access with a spring-loaded latch
(h) Finish: Black polyester power coat paint.
(i) Optics:
(i) IES Type III distribution;
(ii) IP66 rated molded thermal resistant acrylic refractor;
(iii) Lunar optic shielding.
(j) Accessories:
(i) Shorting cap;
(ii) 20’ prewired leads.
(iii) House side shield for lunar optic solid 180^{o}.
(k) Acceptable Manufacturer:
(i) Holophane Acrylic Washington Postlite Utility Model No. AWDE3 P30 40K MVOLT MS AL3LU SH L20 GVDHSL18.

E84.10.2 One piece tapered aluminum pole:

(a) Material:
(i) 6063-T4 aluminum tube;
(ii) Heat treated to T6 condition after welding.
(b) Finish: Powder paint black DBL.
(c) Height: 4.78m (15’ 8”);
(d) Diameter:
(i) Bottom: 178mm (7”);
(ii) Top: 102mm (4”).
(iii) Wall thickness: 4mm (0.156”).
(e) Tenon: 76mm (3”) OD aluminum.

(f) Handhole:
  (i) 100mm (4”) X 200mm (8”) reinforced aluminum opening;
  (ii) 8mm (5/16”) – 18 threaded ground connector hole;
  (iii) Flush fitting aluminum door.

(g) Cast aluminum anchor base.

(h) Acceptable Manufacturer:
  (i) Valmont

E84.10.3 Pathway Lighting Poles Concrete Pile Foundations:

(a) Dimensions:
  (i) Shape: Hexagonal;
  (ii) Length: 1900mm;
  (iii) Width:400mm;

(b) Precast concrete base:
  (i) Conforms to C.S.A. Specification CAN3—A23.1 AND CAN3—A23.4;
  (ii) Cement shall be Type 50, sulphate resistant conforming to C.S.A. Specification CAN/CSA— A5/A8/A362;
  (iii) Minimum Specified Compressive Strength shall be 35 MPa at 28 days;
  (iv) Max. Water/Cement Ratio shall be 0.45, with entrained air of 5 to 8%;
  (v) Minimum concrete cover on all reinforcing steel shall be 50mm;
  (vi) 25mm chamfer on all exposed concrete edges;
  (vii) Each base shall have the number 179 indented (or otherwise permanently marked) on the top of the base.

(c) Poly pipe:
  (i) Series 75;
  (ii) 63mm diameter;
  (iii) Each base shall be equipped with a prominent vee groove located in the chamfer of the base to indicate the location of the poly pipe.

(d) Anchor bolts:
  (i) Four (4) required;
  (ii) Diameter: 25mm;
  (iii) Length: 1750mm;
  (iv) Grade 300W as per CSA G40.21M;
  (v) Threaded 100mm at both ends;
  (vi) One end of each anchor bolt shall be galvanized for a minimum length of 150mm and shall be supplied c/w two 25mm hex nuts and a flat round washer. One nut shall be threaded onto the embedded end of each anchor bolt.
  (vii) Anchor bolt circle diameter: 254mm.
  (viii) All material including nuts and washers to be hot dipped galvanized in accordance with CSA G164-M.

(e) Ties:
  (i) Diameter: 6mm;
  (ii) Spacing: 300mm.

(f) Lifting loops:
  (i) Two (2) required;
  (ii) 3 strand X 4.0mm grade 130 (min. breaking strength = 25kN) galvanized steel wire.

(iii) Loops shall be centred on concrete pile balance point;

(iv) Upper loop attached a maximum of 450mm from the top of the base;

(v) Loops internal clearance: 75mm (min);

(vi) Wire ends shall be embedded 300mm (min).

(g) Acceptable Standard:

(i) MB Hydro Standard Precast Concrete Base For 7.7m Metal Street Light Poles No. CK 15-6 M.

E84.11 Installation

(a) Light Fixtures

(i) Install lamps/LED engines in all fixtures unless otherwise indicated on Contract Drawings.

(ii) Install lighting fixtures in locations indicated on Contract Drawings, or as directed by City of Winnipeg. Align luminaries parallel or perpendicular to building grid line.

(iii) Luminaires to be properly cleaned at time of installation. Luminaries showing marks or scratches due to handling or tool-marked will be rejected without cost to City of Winnipeg.

(iv) Do not daisy-chain light fixture wiring. Provide junction boxes and individual wiring to each light fixture.

E84.12 Spares

(a) Provide two (2) spare pathway lighting poles fitted with one (1) type “C1” and one (1) type “C2” luminaire to be delivered to the City of Winnipeg Streets Dept. Stores Division at 1277 Pacific Ave, Wpg. MB.

MEASUREMENT AND PAYMENT

E84.13 General

(a) Supplying and Installation of Lighting Fixtures complete with fixtures, poles and concrete pile foundations will be measured on a unit basis and paid for at the Contract Unit Price per unit for the “Items of Work” listed 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.

E84.14 Items of Work:

(a) Supply and Installation of Pathway Lighting Fixtures

(i) Pole Mount Fixtures

(ii) Concrete Pile Foundations

E85. MANITOBA HYDRO WORKS

E85.1 Pathway Lighting CSTE Utility Power Services

(a) Coordinate with Manitoba Hydro Street Lighting Department for the provision of three (3) new 100A, 1ø, 3w, 120/240V underground power service to three (3) new CSTE’s “A”, “B” and “C”.

(b) Prior to commencement of work, contractor to finalize arrangements with Manitoba Hydro including staking final grades of the area in addition to confirming locations of utility service pole(s), transformers, routing of underground utility power service conductors, trenching and backfilling, etc.

(c) All work shall be in accordance with Manitoba Hydro Customer Metering Standards, 3rd edition, August 01, 2015.

E85.2 Bridge Roadway Street Lighting Power Service

(a) Coordinate with Manitoba Hydro Street Lighting Department for the connection of the six (6) bridge deck lighting standards power conduits to the exiting Manitoba Hydro roadway lighting power buried conduits at the end(s) of the bridge north bound and south bound lanes.

E85.3 Underbridge Street Lighting Luminaires Installation

(a) Coordinate with Manitoba Hydro Street Lighting Department for the installation of the sixteen (16) underbridge street lighting luminaires, performed by others.

E85.4 Existing Roadway Light Standard Relocation

(a) Coordinate with Manitoba Hydro Street Lighting Department for the relocation of the one (1) existing lighting pole # 2119965 at the corner of Ravelston Ave. W. and El Tassi Dr.

(b) Pole to be relocated approximately 1.5m in front of proposed active transportation pathway as indicated, performed by others.

E85.5 Existing Roadway Light Standards Relamping

(a) Coordinate with Manitoba Hydro Street Lighting Department for the relamping of approximately eight (8) existing pole mounted 60W led luminaires to be replaced with 90W luminaires by others.

APPENDIX A: GEOTECHNICAL REPORT

APPENDIX B: PAVEMENT CORE REPORT

APPENDIX C: AT PATHWAY GEOTECHNICAL REPORT

APPENDIX D: CPKC PROTOCOLS

APPENDIX E: EXAMPLE CPKC CONSTRUCTION PLAN APPLICATION

APPENDIX F: MANITOBA HYDRO CONSTRUCTION STANDARDS AND GUIDELINES

APPENDIX G: EXISTING DRAWINGS

APPENDIX H: TETRA TECH GIRDER AND SUBSTRUCTURE CONDITION ASSESSMENT

APPENDIX I: CURB DETAILS